# The Harman Kardon Model CD401

Manual No. 39A

## ULTRAWIDEBAND LINEAR PHASE CASSETTE DECK

# Technical Manual

harman/kardon
240 CROSSWAYS PARK WEST, WOODBURY, N.Y. 11797
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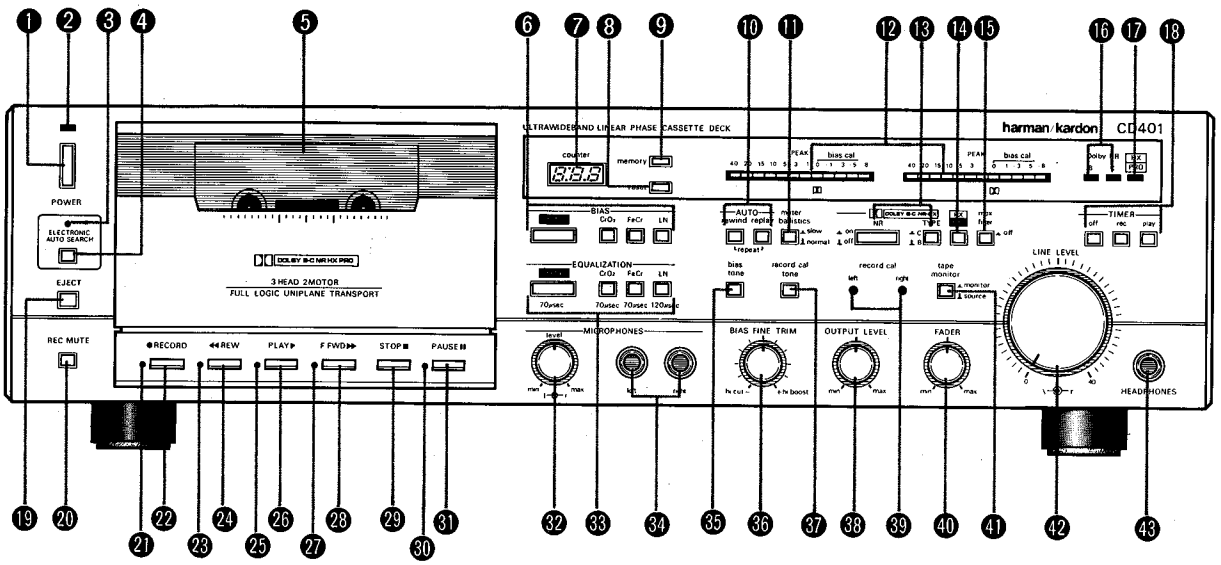
## COMPONENTS AND THEIR FUNCTIONS




### ❶ POWER SWITCH (POWER)
For power turning on and off.
When this switch is pressed with the AC cord plugged to an AC outlet, the POWER INDICATOR illuminates.

### ❷ POWER INDICATOR
For indication of power supply to this unit.

### ❸ ELECTRONIC AUTO SEARCH INDICATOR
For indication of functioning of the electronic auto search system.

### ❹ ELECTRONIC AUTO SEARCH SWITCH (ELECTRONIC AUTO SEARCH)
For quick cueing of the start of a music.
When this switch is depressed, the ELECTRONIC AUTO SEARCH INDICATOR illuminates and a start of each music is automatically searched so as to enable sequential playback of the musics recorded in a tape.

### ❺ CASSETTE COMPARTMENT

### ❻ BIAS SELECTORS (BIAS)
Press the button meeting the type of the tape for recording. If no button is pressed, the RECORD INDICATOR does not turn on and recording cannot be accomplished. These buttons are not effective in tape playback.

### ❼ TAPE COUNTER (counter)
For digital display of the position in a cassette tape.
The figure changes as the tape runs. Cueing for the start of a melody is facilitated by making a note of the counter reading.

### ❽ RESET BUTTON (reset)
For resetting the TAPE COUNTER to "000". Press this button to reset the counter to "000" when starting recording. This button is also used with the MEMORY button to stop tape rewinding automatically at the desired position.

### ❾ MEMORY BUTTON (memory)
For automatic stopping of tape rewinding at a desired position in combination with the RESET button.
Depress this button and push the RESET button during playback or recording to reset the TAPE COUNTER to "000".
When the tape is rewound in this state, tape running automatically stops at the position where the TAPE COUNTER indicates "000".

### ❿ AUTOMATIC REPEAT BUTTONS (AUTO)
- **AUTO REWIND BUTTON (rewind)**
  When this button is set in ON position (pressed), the tape is automatically rewound, after playback or recording to the tape end, either to the beginning of the tape or to "000" of the TAPE COUNTER indication when the MEMORY button is pressed on.
- **AUTO REPLAY BUTTON (replay)**
  When this button is set in ON position (pressed), the tape playback automatically starts after rewound either from "000" position of the TAPE COUNTER indication when the MEMORY button is pressed on or from the beginning of the tape.

When these two buttons are set in ON position (pressed), the tape is automatically rewound from the tape end to the beginning of the tape or to "000" of the TAPE COUNTER indication when the MEMORY button is pressed ON and then playback starts automatically. Automatic rewind and playback are accomplished repeatedly.

### ⓫ METER BALLISTICS SELECTOR (meter ballistics)
For selection between normal and slow LED LEVEL DISPLAY recovery time.

### ⓬ LED LEVEL DISPLAY (PEAK)
For clear indication of the recording or playback level.

### ⓭ *DOLBY NR SYSTEM SELECTOR (DOLBY B-C NR)
- **NR ON/OFF SELECTOR (NR)**
  For recording or playback using the Dolby NR system.
  Press this selector to use the Dolby NR system. The green DOLBY NR INDICATOR (for B-type) or the yellow one (for C-type) illuminates according to the NR TYPE selector position. Press this selector again to invalidate the Dolby NR system.

• **NR TYPE SELECTOR (TYPE)**
For selection of Dolby B- or C-type NR system.
Depress this selector to select the Dolby C-type NR system. Press it again and the B-type is selected.

### ⓮ HX-PRO SWITCH (HX-PRO)
Press the switch when recording in HX-PRO system.

### ⓯ MPX FILTER SWITCH (mpx filter)
For cutting the multiplex noise during recording of an FM stereo broadcasting program by using the Dolby NR system. Depress this switch to invalidate the MPX filter function.

### ⓰ DOLBY NR INDICATORS (Dolby NR B, C)
For indication of the validated Dolby NR system type.

### ⓱ HX-PRO INDICATOR (HX-PRO)
For indication that recording is in progress using HX-PRO system.

### ⓲ TIMER SWITCHES (TIMER)
These switches are used to automatically start recording or playback in combination with an audio timer.
REC Switch: For automatic recording.
PLAY Switch: For automatic tape playback.
OFF Switch: When audio timer is not used.

### ⓳ EJECT BUTTON (EJECT)
For opening the CASSETTE COMPARTMENT door.
The soft eject mechanism opens the door slowly when this button is pressed.

### ⓴ RECORD MUTE BUTTON (REC MUTE)
For providing a soundless interval during recording.
To cut off undesirable sound between melodies, keep this button pressed until the next melody starts. No sound is recorded as long as this button is kept pressed.

### ㉑ RECORD INDICATOR
For indication of recording state.

### ㉒ RECORD BUTTON (● RECORD)
For recording on a tape.
Press this button after pressing the PAUSE button to provide standby state for recording. The RECORD INDICATOR blinks and the PAUSE and PLAY INDICATORS illuminate. Recording starts when the PAUSE button is pressed again. The RECORD INDICATOR goes to continuous illumination and the PAUSE INDICATOR extinguishes.

### ㉓ REWIND INDICATOR
For indication of tape rewinding.

### ㉔ REWIND BUTTON ( ◀◀ REW)
For rewinding of a tape at a high speed.

### ㉕ PLAY INDICATOR
For indication of tape playback.

### ㉖ PLAY BUTTON (PLAY ▶ )
For playback of a tape. Press this button to start playback.

### ㉗ FAST FORWARD INDICATOR
For indication of fast forwarding of a tape.

### ㉘ FAST FORWARD BUTTON (F. FWD ▶▶ )
For fast forwarding of a tape.

### ㉙ STOP BUTTON (STOP■)
For stopping each operation.
Pressing this button stops playback, recording, fast forwarding or rewinding of a tape. It also cancels standby state by PAUSE button operation.

### ㉚ PAUSE INDICATOR
For indication of pause state.

### ㉛ PAUSE BUTTON (PAUSE ▮▮ )
For temporary stopping of playback or recording.
Also press this button to provide standby state for playback or recording.

### ㉜ MICROPHONE INPUT LEVEL CONTROLS (MICROPHONES-level)
For input level control during recording through microphones.
The front side knob is for the left channel and the rear one is for the right channel.
The knobs turn simultaneously when turned normally.

### ㉝ EQUALIZATION SELECTORS (EQUALIZATION)
Press the button meeting the type of the tape for playback.
These buttons are not effective in recording.

### ㉞ MICROPHONE JACKS (MICROPHONES)
For connection of recording microphones.
Use low-impedance microphones.

### ㉟ BIAS TONE BUTTON (bias tone)
For setting of optimal bias for each tape.
While this switch is kept pressed, 400Hz signal is recorded in the left channel, and 12.5 kHz in the right channel.

### ㊱ BIAS FINE TRIM KNOB (BIAS FINE TRIM)
For setting of the optimal bias for the tape to be used.

### ㊲ RECORD CALIBRATION TONE BUTTON (record cal tone)
For recording level calibration according to the type of the tape to be used.
When this switch is kept pressed, 400Hz signal is recorded on the tape. Make adjustment by operating the RECORD CALIBRATION controls during reproduction of this signal recorded on the tape so that the LED LEVEL DISPLAY may indicate 0 dB.

### ㊳ OUTPUT LEVEL CONTROL (OUTPUT LEVEL)
For control of the output level during playback or monitoring of the recorded sound. It also controls the volume of the sound monitored through headphones.

### ㊴ RECORD CALIBRATION CONTROLS (record cal)
Variable resistors to calibrate the recording level to 0 dB according to the type of the tape to be used. Make adjustment with a thin screw-driver through the hole.

### ㊵ FADER KNOB (FADER)
For fade-in and fade-out function to satisfy more variety in recording.
This makes it easy for you to start and/or end an item in recording, and to make the silent pauses.

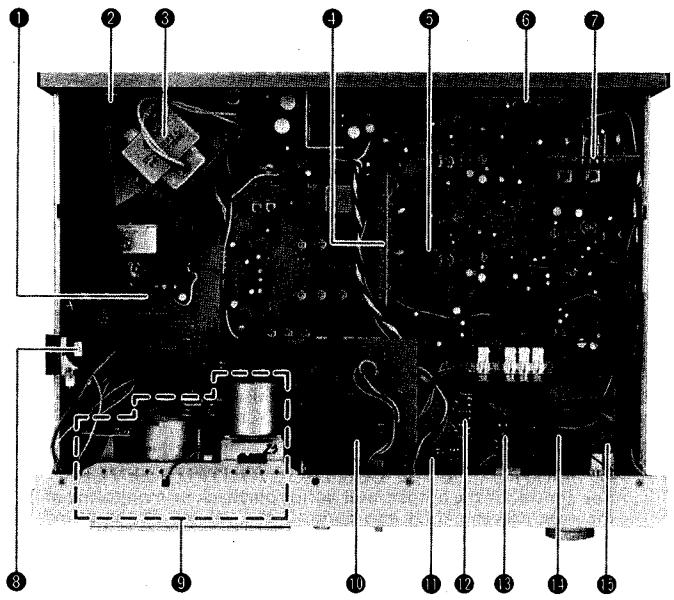
### ㊶ TAPE MONITOR SWITCH (tape monitor)
When the MONITOR position is selected, signal being recorded (playback signal) can be heard. The button goes on indicating that the MONITOR position is selected.
When the SOURCE position is selected, signal before recording (recording input) can be heard.
Check the source sound and playback sound by pressing the switch while recording to check to be sure that source sound is correctly recorded. Be sure to place the switch in the MONITOR position while tape playback.

### ㊷ LINE INPUT LEVEL CONTROL (LINE LEVEL)
For input level control during recording from an external component.
The front side knob is for the left channel and the rear one is for the right channel. The knobs turn simultaneously when turned normally.

### ㊸ HEADPHONES JACK (HEADPHONES)
For connection of stereo headphones.
The sound volume can be adjusted by the OUTPUT LEVEL control.
For tape playback, be sure to set the TAPE MONITOR switch in the MONITOR position without fail.

* Noise reduction system manufactured under license from Dolby Laboratories Licensing Corporation. "Dolby" and the double-D symbols are trademarks of Dolby Laboratories Licensing Corporation.

## INTERNAL VIEW



❶ LOGIC CONTROL P.C. BOARD (PCB-3)
❷ REMOTE CONTROL SOCKET P.C. BOARD (PCB-23)
❸ POWER TRANSFORMER
❹ HX-PRO P.C. BOARD (PCB-4)
❺ MAIN P.C. BOARD (PCB-1)
❻ INPUT AND OUTPUT JACKS P.C. BOARD (PCB-9)
❼ PLAYBACK EQUALIZER AMP.P.C. BOARD (PCB-5)
❽ POWER SWITCH
❾ CASSETTE TAPE RECORDER MECHANICAL ASSEMBLY
❿ ELECTRONIC COUNTER P.C. BOARD (PCB-8)
⓫ METER BALLISTICS AND AUTO PLAY SWITCHES PC.BOARD(PCB-15)
⓬ BIAS AND RECORD CAL TONE P.C. BOARD (PCB-6)
⓭ TAPE MONITOR SWITCH P.C. BOARD (PCB-12)
⓮ MIC. AND LINE AMP. P.C. BOARD (PCB-2)
⓯ TIMER SWITCHES P.C. BOARD (PCB-14)

## DISASSEMBLY PROCEDURES

[DISASSEMBLY OF CABINET]

### 1 CABINET TOP REMOVAL

Remove the screws ❶ to ❻ in Fig. 1 and then remove the cabinet top.

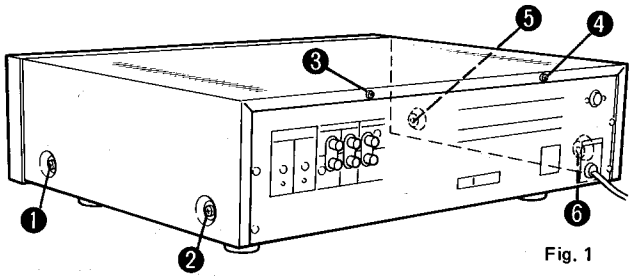


Fig. 1

### 2 CABINET BOTTOM REMOVAL

Remove the screws ❶ to ⓬ in Fig. 2 and then remove the cabinet bottom.

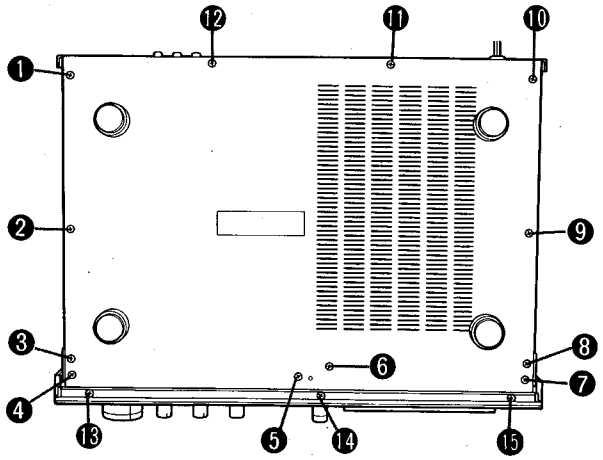


Fig. 2

### 3 FRONT PANEL ASSEMBLY REMOVAL

1. Remove the cabinet top. (Refer to step 1 .)
2. Remove the cassette door assembly.
3. Remove the knobs.
4. Disconnect the connectors (J801, J802) from logic control P.C. board.
5. Remove the screws ⓭ to ⓯ in Fig. 2 and the screws ❶ to ❸ in Fig. 3, and then pull out the front panel forward.
6. Remove the power indicator P.C. board and E.A.S. indicator P.C. board.

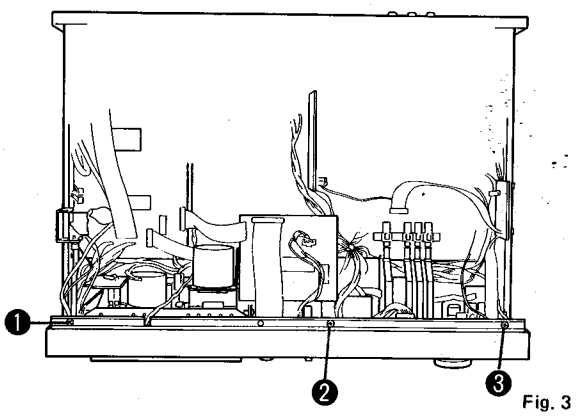


Fig. 3

[CASSETTE MECHANISM DISASSEMBLY AND PARTS REPLACEMENT]

### 1 PINCH ROLLER REPLACEMENT

1. Remove the front panel assembly. (Refer to step 3 of DISASSEMBLY of CABINET.)
2. Remove the spring ❷ and E-stop ring ❶ in Fig. 4 and pull out the pinch roller forward.
3. Join the pinch roller with the lever as shown in Fig. 5 and install them to the shaft. At this time put the A section between B section and fix to the shaft with E-stop ring and attach the spring.

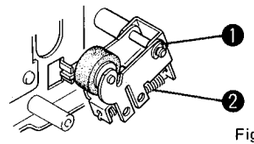


Fig. 4

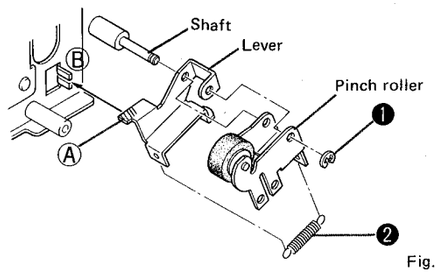



Fig. 5

### 2 HEAD REPLACEMENT

**(ERASE HEAD REPLACEMENT)**

1. Unsolder the lead wire of the erase head. (When wiring, refer to Fig. 7)
2. Remove the screws ❶ and ❷ in Fig. 6 and then replace the erase head. Lock the screws 1 and 2 as not to loosen.

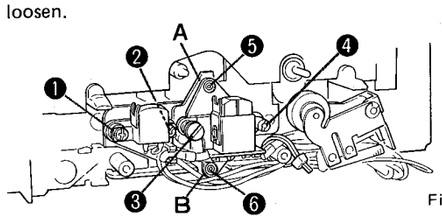



Fig. 6

**(RECORD/PLAYBACK HEAD REPLACEMENT)**

1. Unsolder the lead wire of the record/playback head. (When wiring, refer to Fig. 7)
2. Remove the screws ❸ and ❹ in Fig. 6 and then remove the record/playback head. A and B sections in Fig. 6 are locked with paint, so you can remove the head easily by coming it off.
3. Attach the record/playback head by turning the screws ❸ and ❹ in Fig. 6 provisionally. You may turn the screw ❸ fully, but the screw ❹ is for the azimuth adjustment and the screws ❺ and ❻ are for the positional adjustment. So you should refer to the mechanial adjustment step 1 to 3 and electrical adjustment step 2. And after completing the adjustment, apply screw look paint.

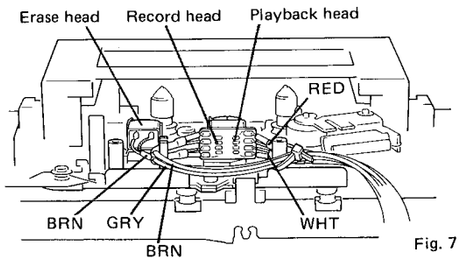



Fig. 7

**(NOTE ON REPLACING THE HEAD)**

* The head housing is very often moved up and down when recording and playing back. In addition to this the lead wires are thin and are easy to be torn off. Connect with the surplus lead wires.
* The lead wires of the inside of the head are very thin and easy to be broken down, so make sure to solder in a short time if possible.

**(NOTE ON THE HEAD CHECK)**

* Do not send a direct current to the head with a tester in purpose of finding out the coils disconnection of the inside of head. This cause to magnetize to the head and cause not to erase with a head eraser.
  Make sure to use a AC/dB meter to find out the head disconnection.
* Apply 1 kHz, 50mV signal to the head with a low frequency oscillator and measure the voltage with a AC/dB meter or monitor with using a earphone, etc. to find out the disconnection.

### 3 DRESSING PLATE ASSEMBLY AND PLATE REMOVAL

Remove the screws ❶ and ❷ in Fig. 8 and then remove the dressing plate assembly and plate.

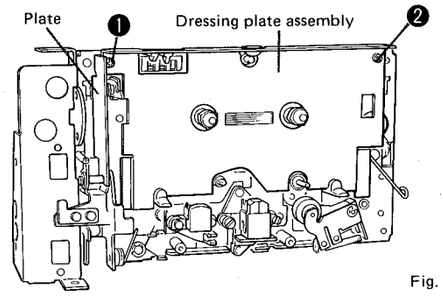



Fig. 8

### 4 CASSETTE MECHANISM UNIT REMOVAL

**(A) HOW TO REMOVE THE LED DISPLAY METER PLATE ASSEMBLY.**

1. Disconnect the connector of the counter display P.C. board.
2. Disconnect the connector of the LED display meter.
3. Remove the screws ❶ and ❷ in Fig. 9 and then remove the dolby NR and HX-PRO indicator P.C. board.
4. Remove the screws ❸ and ❹ in Fig. 9 and then remove the lamp P.C. board.
5. Remove the screws ❶ to ❸ in Fig. 10 and then remove the LED display meter plate assembly.

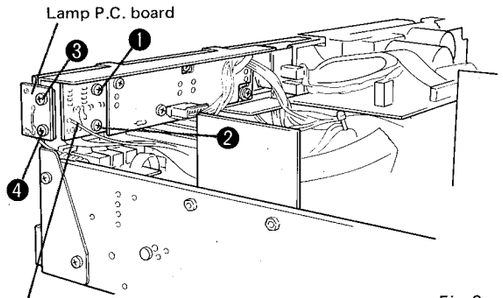



Fig. 9

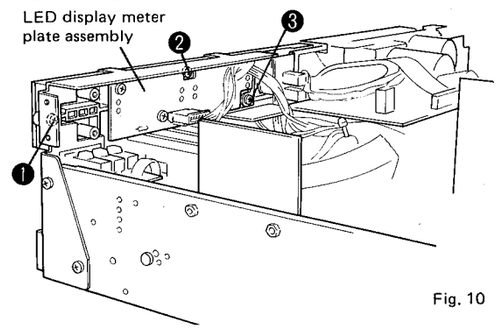



Fig. 10



**(B) CASSETTE MECHANISM UNIT REMOVAL**

1. Remove the screws ❶ to ❹ in Fig. 11 and then remove the bracket.
2. Disconnect the connector which are connected to the cassette mechanism.
3. Remove the push button assembly, power.
4. Remove the screws ❶ and ❷ in Fig. 12 and screws ❶ to ❹ in Fig. 13, and then remove the cassette mechanism unit.

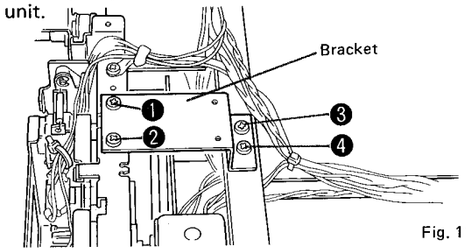



Fig. 11

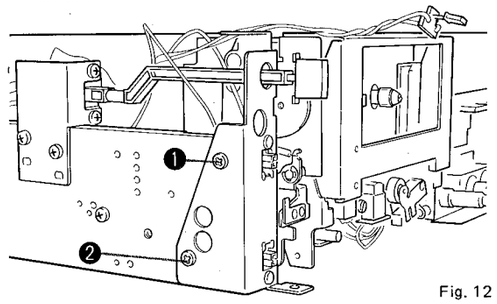


Fig. 12

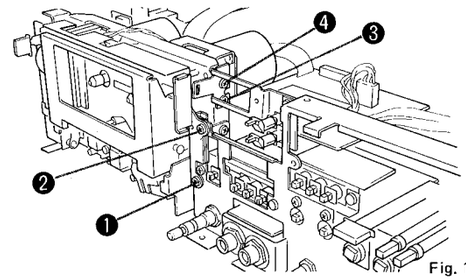


Fig. 13

### 5 REEL MOTOR AND CLUTCH REPLACEMENT

1. Remove the screws ❶ and ❷ in Fig. 14 and then remove the reel motor bracket assembly from the cassette mechanism.
2. Remove the sub belt.

**(REEL MOTOR REPLACEMENT)**

1. Remove two screws by which the motor is fixed and then remove the reel motor.
2. When assembling the reel motor, make sure to assemble it by moving in the direction of an arrows as shown in Fig. 15.
   (Refer to Fig. 14 when wiring.)

**(CLUTCH REPLACEMENT)**

1. Remove the lock washer and then remove the clutch.

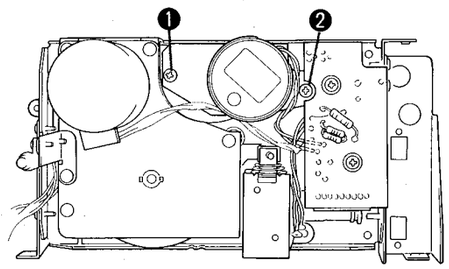


Fig. 14

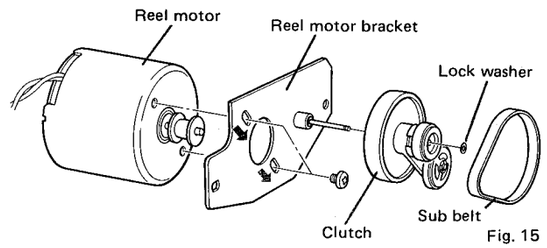



Fig. 15

### 6 CAPSTAN MOTOR, BELT AND FLYWHEEL REPLACEMENT

1. Remove the screw ❶ in Fig. 16 and then remove the damper bracket.
2. Remove the screws ❷ to ❺ in Fig. 16 and remove the capstan motor bracket. At this time the main belt should have been removed from the capstan motor pulley.
3. Remove the screws ❶ to ❸ in Fig. 17 and then replace the capstan motor.
4. Remove the flywheel by pulling out toward to the backward as it is.
   When assembling the flywheel, be careful not to forget attaching the washer.
   (Refer to Fig. 18)

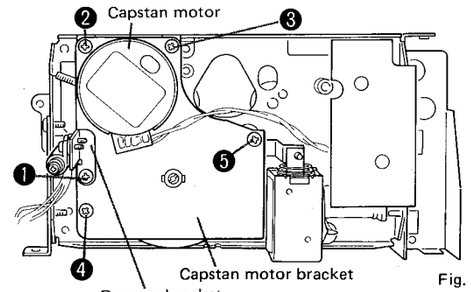



Fig. 16

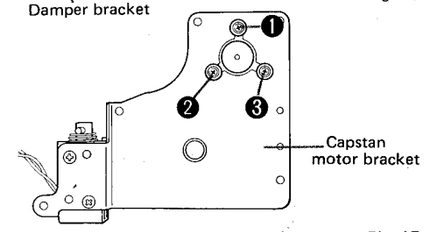



Fig. 17

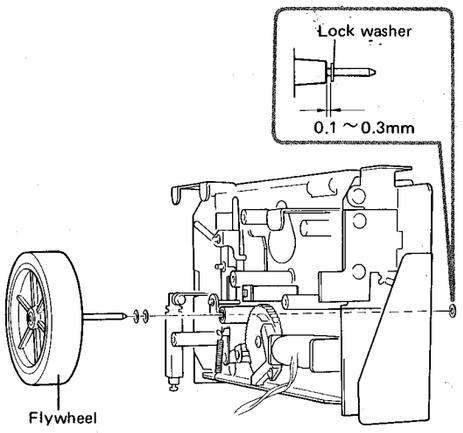



Fig. 18

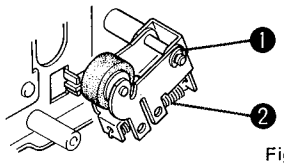


Fig. 4

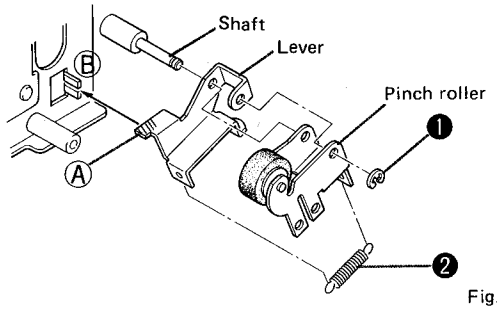



Fig. 5

## 2 HEAD REPLACEMENT

### (ERASE HEAD REPLACEMENT)

1. Unsolder the lead wire of the erase head. (When wiring, refer to Fig. 7)
2. Remove the screws ❶ and ❷ in Fig. 6 and then replace the erase head. Lock the screws 1 and 2 as not to loosen.

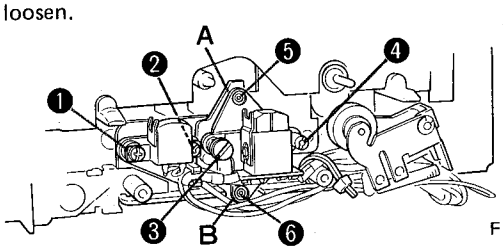



Fig. 6

### (RECORD/PLAYBACK HEAD REPLACEMENT)

1. Unsolder the lead wire of the record/playback head. (When wiring, refer to Fig. 7)
2. Remove the screws ❸ and ❹ in Fig. 6 and then remove the record/playback head. A and B sections in Fig. 6 are locked with paint, so you can remove the head easily by coming it off.
3. Attach the record/playback head by turning the screws ❸ and ❹ in Fig. 6 provisionally. You may turn the screw ❸ fully, but the screw ❹ is for the azimuth adjustment and the screws ❺ and ❻ are for the positional adjustment. So you should refer to the mechanial adjustment step 1 to 3 and electrical adjustment step 2. And after completing the adjustment, apply screw look paint.

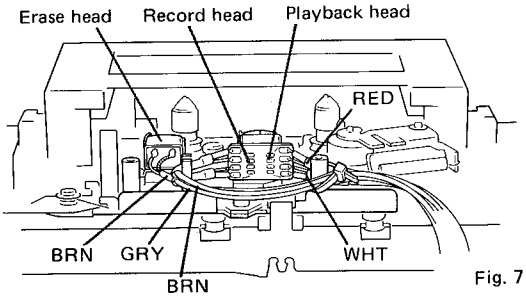



Fig. 7

### (NOTE ON REPLACING THE HEAD)

* The head housing is very often moved up and down when recording and playing back. In addition to this the lead wires are thin and are easy to be torn off. Connect with the surplus lead wires.
* The lead wires of the inside of the head are very thin and easy to be broken down, so make sure to solder in a short time if possible.

### (NOTE ON THE HEAD CHECK)

* Do not send a direct current to the head with a tester in purpose of finding out the coils disconnection of the inside of head. This cause to magnetize to the head and cause not to erase with a head eraser.
  Make sure to use a AC/dB meter to find out the head disconnection.
* Apply 1 kHz, 50mV signal to the head with a low frequency oscillator and measure the voltage with a AC/dB meter or monitor with using a earphone, etc. to find out the disconnection.

## 3 DRESSING PLATE ASSEMBLY AND PLATE REMOVAL

Remove the screws ❶ and ❷ in Fig. 8 and then remove the dressing plate assembly and plate.

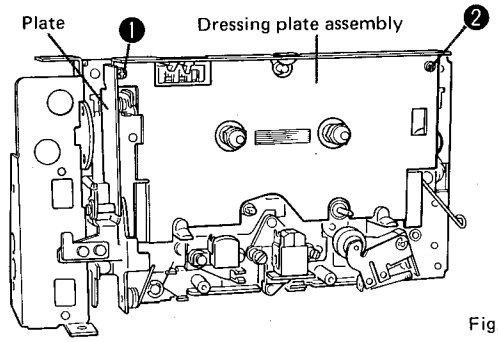



Fig. 8

## 4 CASSETTE MECHANISM UNIT REMOVAL

### (A) HOW TO REMOVE THE LED DISPLAY METER PLATE ASSEMBLY.

1. Disconnect the connector of the counter display P.C. board.
2. Disconnect the connector of the LED display meter.
3. Remove the screws ❶ and ❷ in Fig. 9 and then remove the dolby NR and HX-PRO indicator P.C. board.
4. Remove the screws ❸ and ❹ in Fig. 9 and then remove the lamp P.C. board.
5. Remove the screws ❶ to ❸ in Fig. 10 and then remove the LED display meter plate assembly.

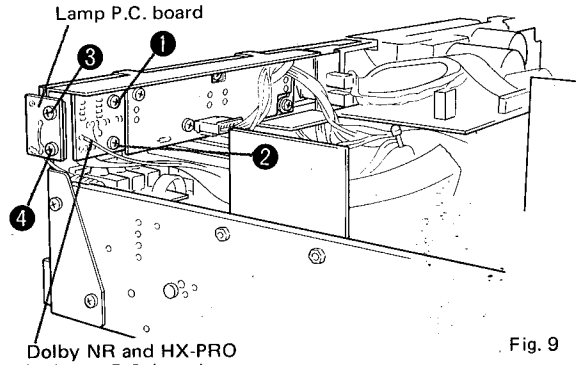



Fig. 9

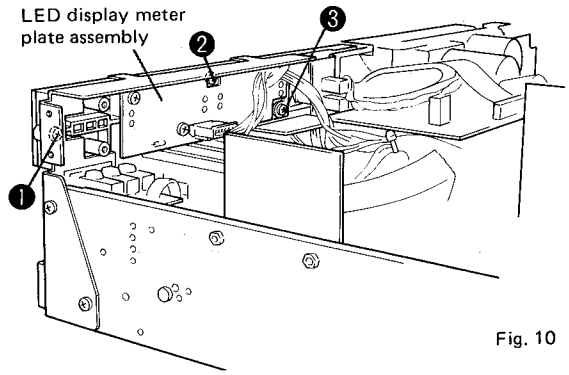



Fig. 10

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Fig. 8

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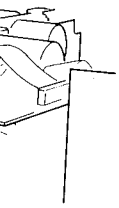


Fig. 9

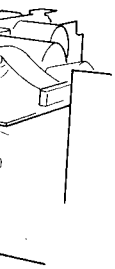


Fig. 10



### (B) CASSETTE MECHANISM UNIT REMOVAL

1. Remove the screws ❶ to ❹ in Fig. 11 and then remove the bracket.
2. Disconnect the connector which are connected to the cassette mechanism.
3. Remove the push button assembly, power.
4. Remove the screws ❶ and ❷ in Fig. 12 and screws ❶ to ❹ in Fig. 13, and then remove the cassette mechanism unit.

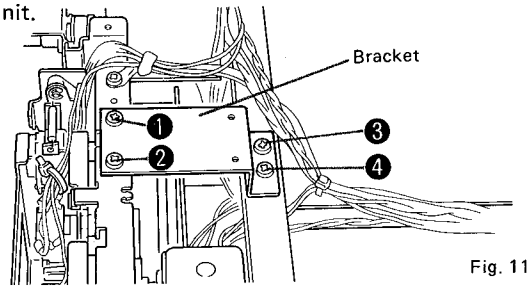



Fig. 11

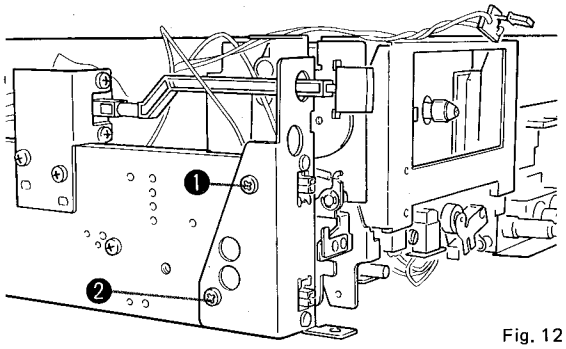



Fig. 12

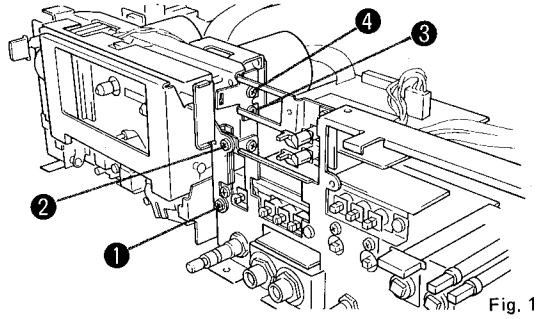



Fig. 13

### 5 REEL MOTOR AND CLUTCH REPLACEMENT

1. Remove the screws ❶ and ❷ in Fig. 14 and then remove the reel motor bracket assembly from the cassette mechanism.
2. Remove the sub belt.

**(REEL MOTOR REPLACEMENT)**

1. Remove two screws by which the motor is fixed and then remove the reel motor.
2. When assembling the reel motor, make sure to assemble it by moving in the direction of an arrows as shown in Fig. 15.
   (Refer to Fig. 14 when wiring.)

**(CLUTCH REPLACEMENT)**

1. Remove the lock washer and then remove the clutch.

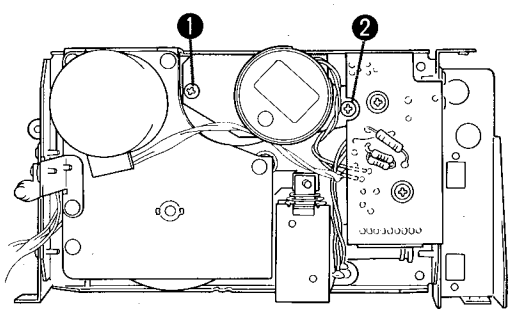



Fig. 14

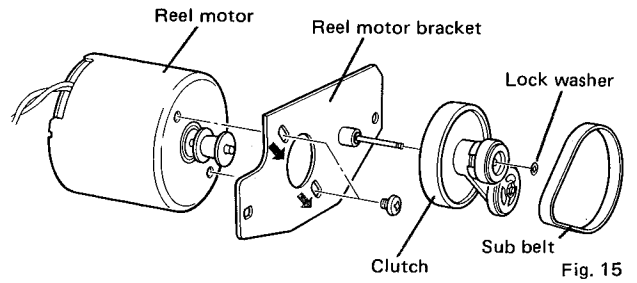



Fig. 15

### 6 CAPSTAN MOTOR, BELT AND FLYWHEEL REPLACEMENT

1. Remove the screw ❶ in Fig. 16 and then remove the damper bracket.
2. Remove the screws ❷ to ❺ in Fig. 16 and remove the capstan motor bracket. At this time the main belt should have been removed from the capstan motor pulley.
3. Remove the screws ❶ to ❸ in Fig. 17 and then replace the capstan motor.
4. Remove the flywheel by pulling out toward to the backward as it is.
   When assembling the flywheel, be careful not to forget attaching the washer.
   (Refer to Fig. 18)

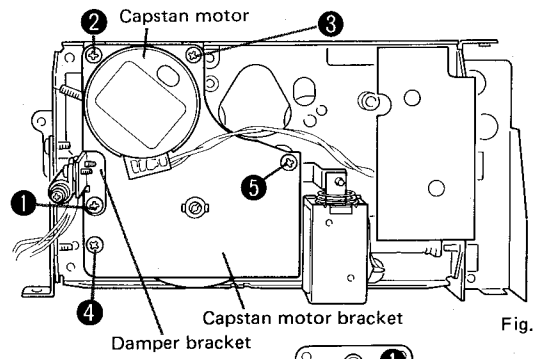



Fig. 16

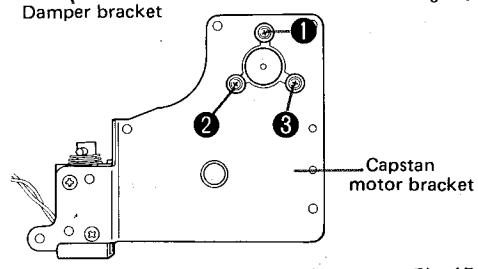



Fig. 17

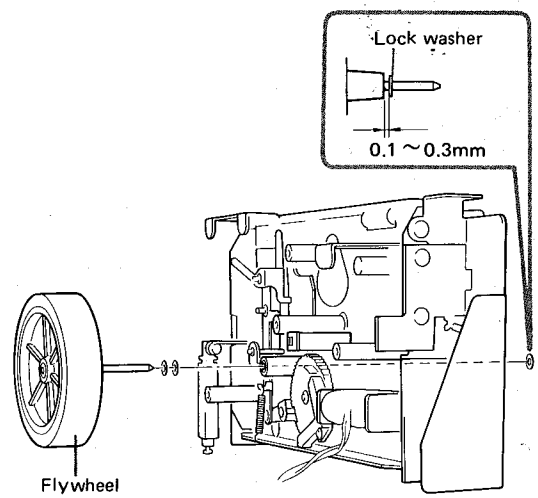



Fig. 18

## SPECIFICATONS

Track Configuration: 4-track 2 channel Stereo Cassette Deck

- **MECHANICAL SECTION**

| | Nominal | Limit |
|---|---|---|
| Tape Speed | 4.75cm/sec. | ±1% |
| Wow and Flutter | 0.04%(NAB) | ≤ 0.1% |
| | 0.06%(DIN) | |
| F.FWD/REW. Time for C-60 Cassette | 75sec. | ≤ 85sec. |
| Motor | 1 DC Servo motor (Capstan) 1 Flat Torque DC motor (Reel) | |
| Take Up Torque | 50gcm | |
| F.FWD Torque | 100gcm | |
| REW. Torque | 100gcm | |

- **HEAD SECTION**

| | |
|---|---|
| Recording/Playback | Fe-Al-Si Alloy Core |
| Erase | Ferrite Core |

- **AMPLIFIER SECTION**

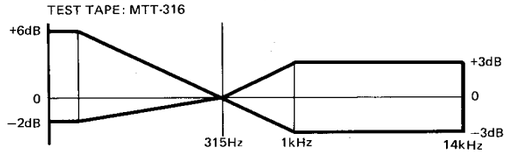
Input Sensitivity

| | | |
|---|---|---|
| MIC | 0.8mV | 0.2(min) ~ 1.0(max)mV |
| LINE (Low) | 70mV | 60(min) ~ 150(max)mV |
| LINE (High) | 240mV | 200(min) ~ 400(max)mV |

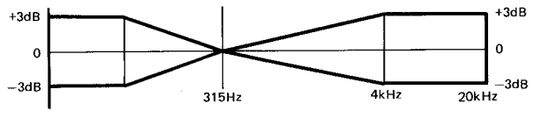
| | Nominal | Limit |
|---|---|---|
| Input Impedance | | |
| MIC | 2.7kΩ | 2(min) ~ 4(max)kΩ |
| LINE (Low) | 16.5kΩ | 10(min) ~ 20(max)kΩ |
| LINE (High) | 33kΩ | 20(min) ~ 40(max)kΩ |
| Signal-to-Noise Ratio (Dolby B to ON) | | |
| at MIC input | 52dB | ≤ 46dB |
| | (Input 1kHz, 1.5mV for normal tape) | |
| at LINE (Low) input | 61dB | |
| | (Input 1kHz, 100mV for normal tape) | |
| Erase Ratio | 71dB | ≤ 60dB |
| | (Input 80Hz for normal tape) | |
| Channel Separation | 43dB | ≤ 35dB |
| | (Input 1kHz) | |
| Crosstalk | 73dB | ≤ 60dB |
| | (Input 1kHz) | |

- **DIMENSIONS (W x H x D)** 17-7/16"x4-5/16"x12-5/8" (443x110x320 mm)
- **WEIGHT** 16.1 lbs (7.3kg)
- **POWER SUPPLY** AC120V, 60Hz
- **POWER CONSUMPTION** 40W

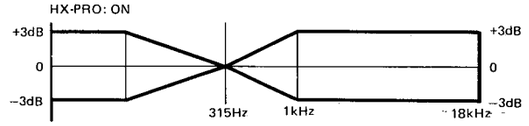
PLAYBACK FREQUENCY RESPONSE
TEST TAPE: MTT-316



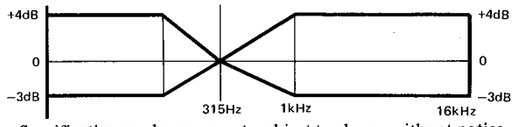

RECORD/PLAYBACK FREQUENCY RESPONSE
TEST TAPE: XL-1, CS-30, AC-512, AC-711
DOLBY NR: OFF
HX-PRO: ON




RECORD/PLAYBACK FREQUENCY RESPONSE
TEST TAPE: XL-1, CS-30, AC-512, AC-711
DOLBY NR: TYPE B ON
HX-PRO: ON




RECORD/PLAYBACK FREQUENCY RESPONSE
TEST TAPE: XL-1, CS-30, AC-512, AC-711
DOLBY NR: TYPE C ON
HX-PRO: ON




Specifications and components subject to change without notice.
Overall performance will be maintained or improved.

## ALIGNMENT PROCEDURES

### ■ ELECTRICAL ADJUSTMENT

#### 1. BEFORE ADJUSTMENT

- Make sure that primary supply voltage comes within 120V ± 2V.
- After the power switch is pushed on, wait for 10 minutes before measuring to be sure of the most stable operation.
- Since head magnetization, dust accumulations, etc. are likely to introduce error in the various characteristics, it is very important that the heads are properly demagnetized and cleaned before commencing any adjustment, particularly frequency response and head azimuth adjustment.
- Proceed with the recording section adjustment after having finished the playback section adjustment. Should the recording section adjustment be carried out without having completed the playback section adjustment perfectly, the recorded tape may not be played back properly with the other tape deck and the adjustment itself may become impossible.

#### 2. INSTRUMENTS REQUIRED

- Low frequency oscillator
- AC VTVM or dual channel AC VTVM
- Oscilloscope
- Wow/flutter meter

#### 3. TEST TAPE

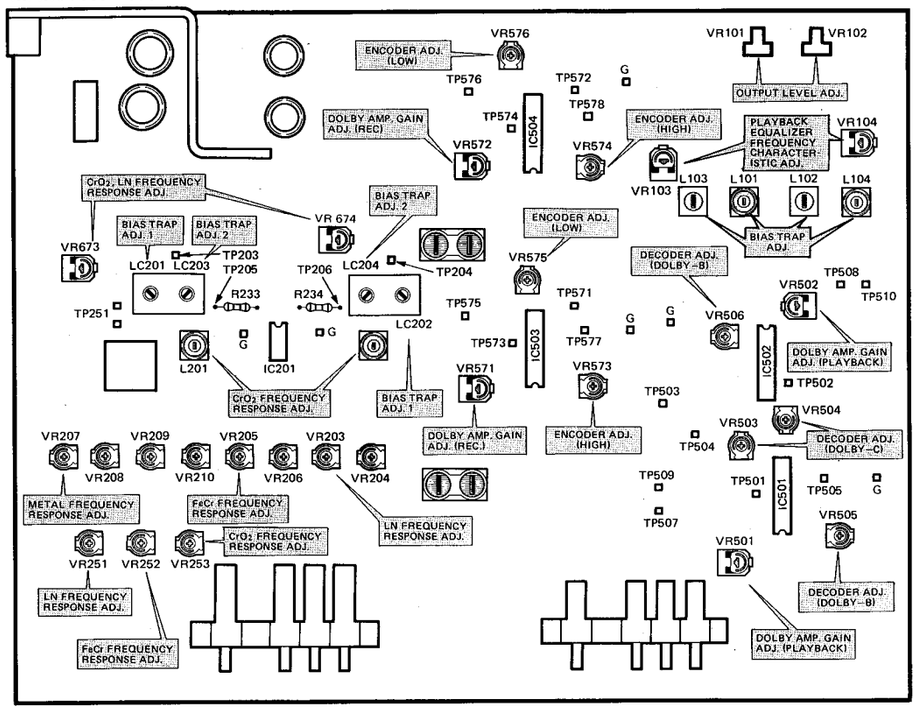
- Azimuth adjustment . . . . . MTT-114
- Tape speed adjustment . . . . . MTT-111
- Output level (Playback mode) . . . . MTT-150
- Metal bias temporary adjustment . . . AC-711
- Metal record level temporary adjustment . . . AC-711
- Frequency response adjustment
  - LN . . . . . XL-I
  - FeCr . . . . . CS-30
  - $CrO_2$ . . . . . AC-512
  - Metal . . . . . AC-711
- Record level adjustment . . . . . AC-512

*C-90 differs with C-60 in the thickness and bias is unequal, so adjust with the tape whose bias is of specified value.

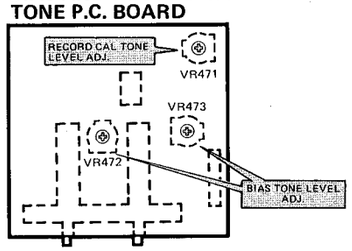


### ■ ADJUSTMENT AND TEST POINTS

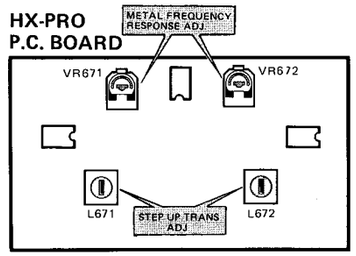
MAIN P.C. BOARD



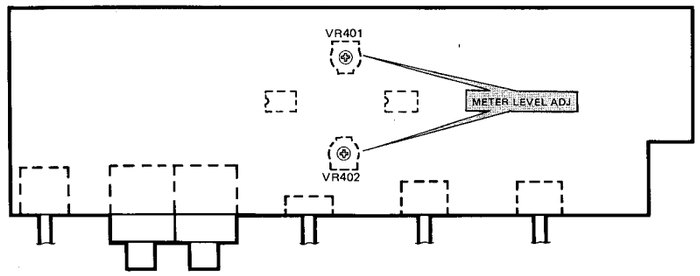

BIAS AND RECORD CAL TONE P.C. BOARD




HX-PRO P.C. BOARD




MIC. AND LINE AMP. P.C. BOARD



## SPECIFICATONS

Track Configuration: 4-track 2 channel Stereo Cassette Deck

- **MECHANICAL SECTION**

| | Nominal | Limit |
|---|---|---|
| Tape Speed | 4.75cm/sec. | ±1% |
| Wow and Flutter | 0.04%(NAB) | ≤ 0.1% |
| | 0.06%(DIN) | |
| F.FWD/REW. Time for C-60 Cassette | 75sec. | ≤ 85sec. |
| Motor | 1 DC Servo motor (Capstan)<br>1 Flat Torque DC motor (Reel) | |
| Take Up Torque | 50gcm | |
| F.FWD Torque | 100gcm | |
| REW. Torque | 100gcm | |

- **HEAD SECTION**

| | |
|---|---|
| Recording/Playback | Fe-Al-Si Alloy Core |
| Erase | Ferrite Core |

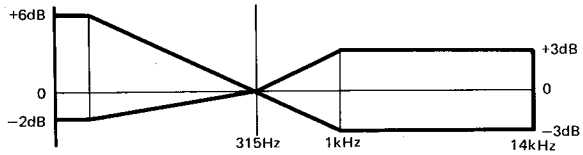
- **AMPLIFIER SECTION**

| Input Sensitivity | Nominal | Limit |
|---|---|---|
| MIC | 0.8mV | 0.2(min) ~ 1.0(max)mV |
| LINE (Low) | 70mV | 60(min) ~ 150(max)mV |
| LINE (High) | 240mV | 200(min) ~ 400(max)mV |

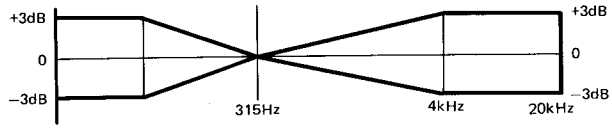
| | Nominal | Limit |
|---|---|---|
| Input Impedance | | |
| MIC | 2.7kΩ | 2(min) ~ 4(max)kΩ |
| LINE (Low) | 16.5kΩ | 10(min) ~ 20(max)kΩ |
| LINE (High) | 33kΩ | 20(min) ~ 40(max)kΩ |
| Signal-to-Noise Ratio (Dolby B to ON) | | |
| at MIC input | 52dB | ≤ 46dB |
| | (Input 1kHz, 1.5mV for normal tape) | |
| at LINE (Low) input | 61dB | |
| | (Input 1kHz, 100mV for normal tape) | |
| Erase Ratio | 71dB | ≤ 60dB |
| | (Input 80Hz for normal tape) | |
| Channel Separation | 43dB | ≤ 35dB |
| | (Input 1kHz) | |
| Crosstalk | 73dB | ≤ 60dB |
| | (Input 1kHz) | |

- **DIMENSIONS (W x H x D)** 17-7/16"x4-5/16"x12-5/8" (443x110x320 mm)
- **WEIGHT** 16.1 lbs (7.3kg)
- **POWER SUPPLY** AC120V, 60Hz
- **POWER CONSUMPTION** 40W

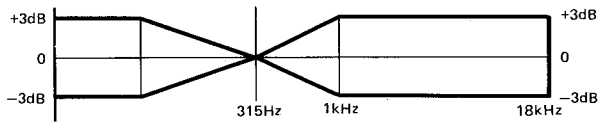
PLAYBACK FREQUENCY RESPONSE
TEST TAPE: MTT-316



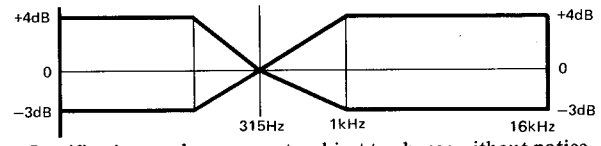

RECORD/PLAYBACK FREQUENCY RESPONSE
TEST TAPE: XL-1, CS-30, AC-512, AC-711
DOLBY NR: OFF
HX-PRO: ON




RECORD/PLAYBACK FREQUENCY RESPONSE
TEST TAPE: XL-1, CS-30, AC-512, AC-711
DOLBY NR: TYPE B ON
HX-PRO: ON




RECORD/PLAYBACK FREQUENCY RESPONSE
TEST TAPE: XL-1, CS-30, AC-512, AC-711
DOLBY NR: TYPE C ON
HX-PRO: ON




Specifications and components subject to change without notice.
Overall performance will be maintained or improved.

## ALIGNMENT PROCEDURES

### ■ ELECTRICAL ADJUSTMENT

#### 1. BEFORE ADJUSTMENT

- Make sure that primary supply voltage comes within 120V ± 2V.
- After the power switch is pushed on, wait for 10 minutes before measuring to be sure of the most stable operation.
- Since head magnetization, dust accumulations, etc. are likely to introduce error in the various characteristics, it is very important that the heads are properly demagnetized and cleaned before commencing any adjustment, particularly frequency response and head azimuth adjustment.
- Proceed with the recording section adjustment after having finished the playback section adjustment. Should the recording section adjustment be carried out without having completed the playback section adjustment perfectly, the recorded tape may not be played back properly with the other tape deck and the adjustment itself may become impossible.

#### 2. INSTRUMENTS REQUIRED

- Low frequency oscillator
- AC VTVM or dual channel AC VTVM
- Oscilloscope
- Wow/flutter meter

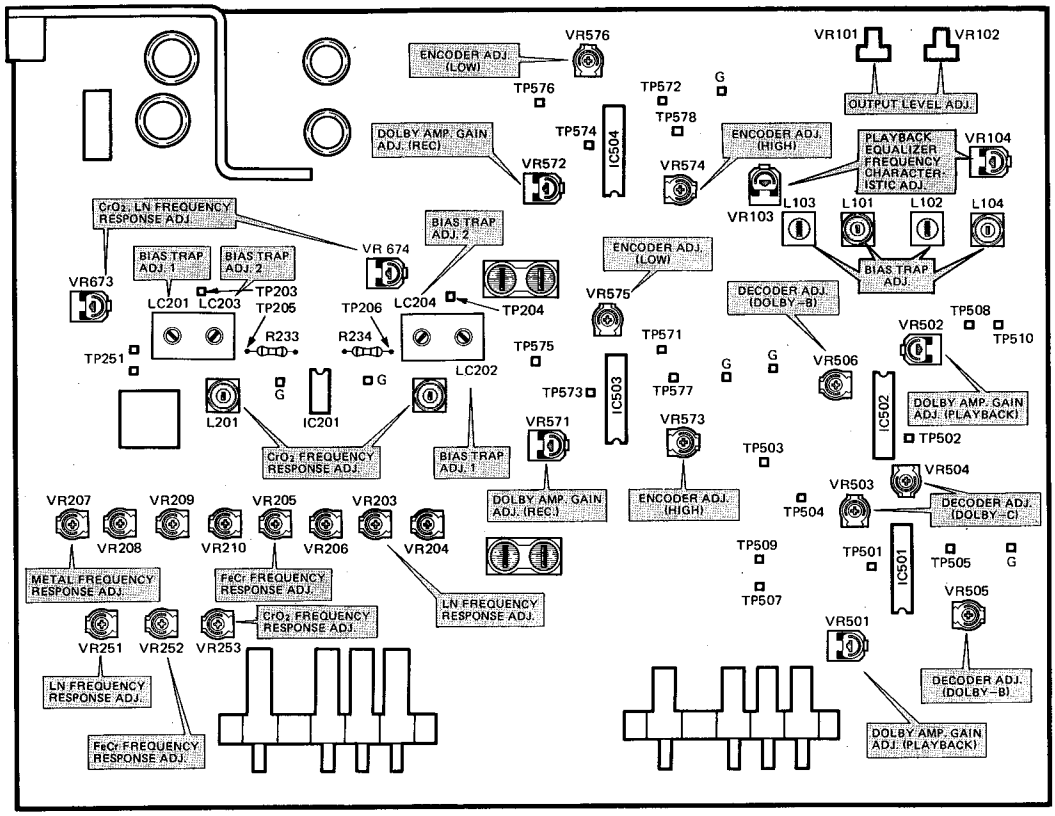
#### 3. TEST TAPE

- Azimuth adjustment . . . . . MTT-114
- Tape speed adjustment . . . . . MTT-111
- Output level (Playback mode) . . . . MTT-150
- Metal bias temporary adjustment . . . AC-711
- Metal record level temporary adjustment . . . AC-711
- Frequency response adjustment
  - LN . . . . . XL-I
  - FeCr . . . . . CS-30
  - $CrO_2$ . . . . . AC-512
  - Metal . . . . . AC-711
- Record level adjustment . . . . . AC-512

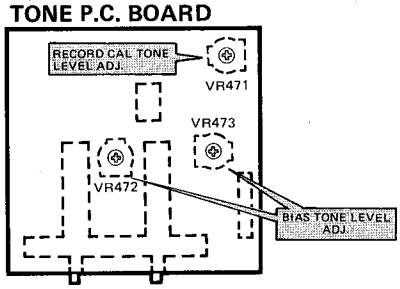
* C-90 differs with C-60 in the thickness and bias is unequal, so adjust with the tape whose bias is of specified value.

## ■ ADJUSTMENT AND TEST POINTS

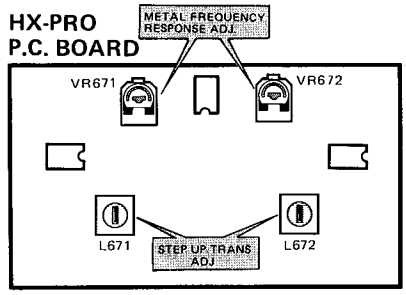
### MAIN P.C. BOARD



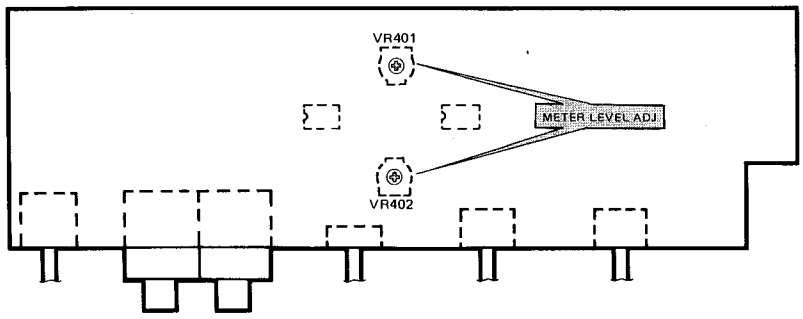

### BIAS AND RECORD CAL TONE P.C. BOARD



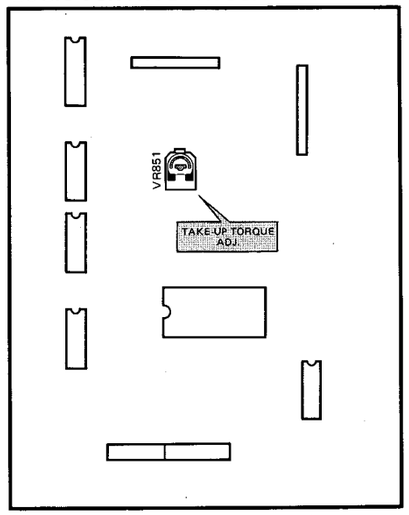

### HX-PRO P.C. BOARD

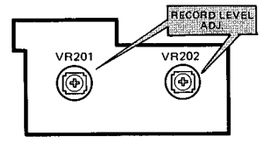



### MIC. AND LINE AMP. P.C. BOARD



LOGIC CONTROL P.C. BOARD




RECORD CAL P.C. BOARD

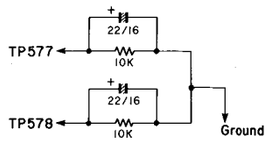



Fig. 1

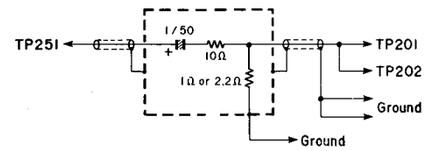



Fig. 3

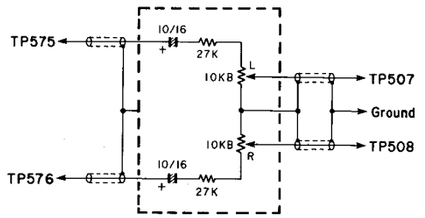



Fig. 2

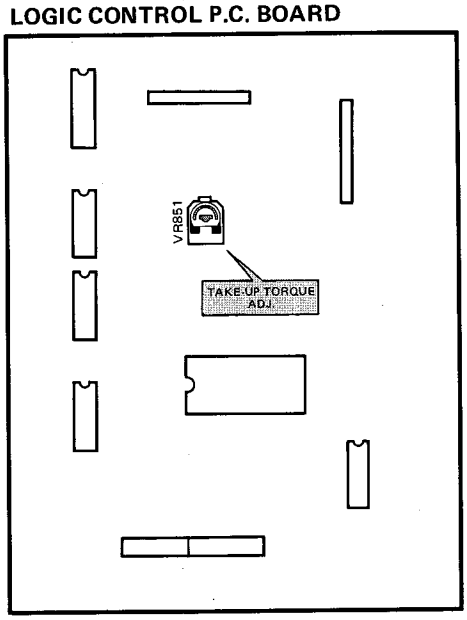
**General conditions (unless otherwise noted).**

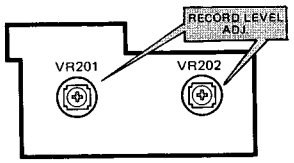
| CONTROLS AND SWITCHES | SETTINGS |
|---|---|
| Dolby NR | off |
| MPX Filter | off |
| Microphones Level | min |
| Bias Fine Trim | center |
| Output Level | max |
| Line Input Level | max |
| HX-PRO | off |

## ■ELECTRICAL ADJUSTMENT

| STEP | ADJUSTMENT ITEM | INSTRUMENT REQUIRED | MODE | INPUT SIGNAL | POINT TO BE CONNECTED | ADJUST POINT | RATING | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 1 | Take up torque | Cassette tape torque meter (TW-2111) | PB | | | VR851 | 50gcm | |
| 2-1 | Azimuth & playback equalizer frequency characteristic | VTVM Test tape (TCC-288H) | PB | | TP501 or Tp502 | Azimuth screw | Maximum output | • Short the TP507 and TP509, TP508 and TP510.<br>• Adjust with 20kHz test tone signal. |
| 2-2 | | | | | TP501 TP502 | VR103 VR104 | With the 20kHz test tone, the output becomes +2dB more than that with 1kHz test tone. | |
| 3 | Tape speed | Frequency counter Test tape (MTT-111) | PB | | TP501 or TP502 | VR built in motor | 3kHz ± 10Hz | • Short the TP507 and TP509, TP508 and TP510.<br>• Make the adjustment at about the half way point in the tape. |
| 4 | Playback Dolby amp. gain | VTVM | PB | Apply 700Hz signal to TP507(L), TP508(R) and ground. Set audio generator so that TP501 and TP502 voltage is 775mV. | TP503 TP504 | VR501 VR502 | 775mV | |
| 5 | Playback amp. level | VTVM Test tape (MTT-150) | PB | | TP501 TP502 | VR101 VR102 | 775mV | • Short the TP507 and TP509, TP508 and TP510. |
| 6 | Record Dolby amp. gain | VTVM | REC-PAUSE | Apply 700Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP571 and TP572 voltage is 775mV. | TP573 TP574 | VR571 VR572 | 775mV | |
| 7-1 | Dolby encoder | VTVM | REC-PAUSE | Apply 700Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 23.5mV when REC-PAUSE mode. | TP575 TP576 | VR575 VR576 | So that a +6.5dB boost is obtained when dolby is switched from off to dolby-C. | • Attach the jig shown in Fig. 1 and adjust. |
| 7-2 | | | | | TP575 TP576 | VR573 VR574 | So that a +11dB ±0.25dB boost is obtained when dolby is switched from off to dolby-C. | • Repeat the high level stage and low level stage adjustments 2—3 times. |
| 8-1 | Dolby decoder | VTVM | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 44mV. Adjust the output of TP501 and TP502 to 44mV with the L and R potentiometers on the jig (Fig. 2). Then, adjust with a 20Hz to 30kHz sweep signal. | TAPE OUT | VR505 VR506 | So that frequency response is flat. | • Attach the jig shown in Fig. 2 and adjust.<br>• Dolby B is on. |
| 8-2 | | | | | TAPE OUT | VR503 VR504 | So that frequency response is flat. | • Dolby C is on.<br>• Make this adjustment for dolby-B first, then recheck dolby-B after adjusting dolby-C. |
| 9-1 | Bias trap | VTVM | REC/PB | | TP203 TP204 | LC201 LC202 | Maximum output | • Bias fine trim control is hi cut.<br>• Bias selector is metal position.<br>• Turn the VR671 maxmum clockwise and VR672 maximum counter-clockwise position.<br>• Repeat adjustments 1 and 2, then do them again after completing adjustment 3. |
| 9-2 | | | | | TP203 TP204 | L671 L672 | Maximum output | |
| 9-3 | | | | | TP205 TP206 | LC203 LC204 | Minimum output | |
| 10 | Play bias trap | VTVM | REC/PB | | TP501 TP502 | L101 L103 L102 L104 | Minimum output | • Bias selector is metal position.<br>• Short the TP507 and TP509, TP508 and TP510.<br>• Attach the jig shown in Fig. 3 and adjust.<br>• Adjust L101/L102 and L103/L104 in alternation. |

LOGIC CONTROL P.C. BOARD



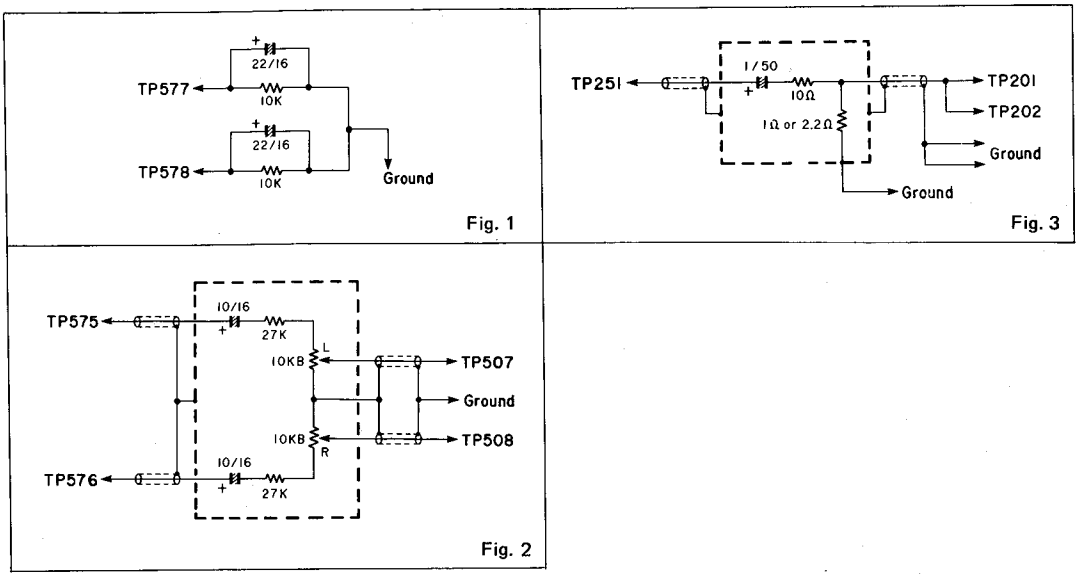

RECORD CAL P.C. BOARD

**General conditions (unless otherwise noted).**

| CONTROLS AND SWITCHES | SETTINGS |
|---|---|
| Dolby NR | off |
| MPX Filter | off |
| Microphones Level | min |
| Bias Fine Trim | center |
| Output Level | max |
| Line Input Level | max |
| HX-PRO | off |

## ■ELECTRICAL ADJUSTMENT

| STEP | ADJUSTMENT ITEM | INSTRUMENT REQUIRED | MODE | INPUT SIGNAL | POINT TO BE CONNECTED | |
|---|---|---|---|---|---|---|
| 1 | Take up torque | Cassette tape torque meter (TW-2111) | PB | | | V |
| 2-1 | Azimuth & playback equalizer frequency characteristic | VTVM<br>Test tape (TCC-288H) | PB | | TP501 or Tp502 | A<br>sc |
| 2-2 | | | | | TP501<br>TP502 | V<br>V |
| 3 | Tape speed | Frequency counter<br>Test tape (MTT-111) | PB | | TP501 or TP502 | V<br>in |
| 4 | Playback Dolby amp. gain | VTVM | PB | Apply 700Hz signal to TP507(L), TP508(R) and ground. Set audio generator so that TP501 and TP502 voltage is 775mV. | TP503<br>TP504 | V<br>V |
| 5 | Playback amp. level | VTVM<br>Test tape (MTT-150) | PB | | TP501<br>TP502 | V<br>V |
| 6 | Record Dolby amp. gain | VTVM | REC-PAUSE | Apply 700Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP571 and TP572 voltage is 775mV. | TP573<br>TP574 | V<br>V |
| 7-1 | Dolby encoder | VTVM | REC-PAUSE | Apply 700Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 23.5mV when REC-PAUSE mode. | TP575<br>TP576 | V<br>V |
| 7-2 | | | | | TP575<br>TP576 | V<br>V |
| 8-1 | Dolby decoder | VTVM | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 44mV.<br>Adjust the output of TP501 and TP502 to 44mV with the L and R potentiometers on the jig (Fig. 2). Then, adjust with a 20Hz to 30kHz sweep signal. | TAPE OUT | V<br>V |
| 8-2 | | | | | TAPE OUT | V<br>V |
| 9-1 | Bias trap | VTVM | REC/PB | | TP203<br>TP204 | L<br>L |
| 9-2 | | | | | TP203<br>TP204 | L<br>L |
| 9-3 | | | | | TP205<br>TP206 | L<br>L |
| 10 | Play bias trap | VTVM | REC/PB | | TP501<br>TP502 | L<br>L |




| TTINGS |
|---|
| off |
| off |
| min |
| center |
| max |
| max |
| off |

| | POINT TO BE CONNECTED | ADJUST POINT | RATING | REMARKS |
|---|---|---|---|---|
| | | VR851 | 50gcm | |
| | TP501 or Tp502 | Azimuth screw | Maximum output | • Short the TP507 and TP509, TP508 and TP510.<br>• Adjust with 20kHz test tone signal. |
| | TP501 TP502 | VR103 VR104 | With the 20kHz test tone, the output becomes +2dB more than that with 1kHz test tone. | |
| | TP501 or TP502 | VR built in motor | 3kHz ± 10Hz | • Short the TP507 and TP509, TP508 and TP510.<br>• Make the adjustment at about the half way point in the tape. |
| and nd | TP503 TP504 | VR501 VR502 | 775mV | |
| | TP501 TP502 | VR101 VR102 | 775mV | • Short the TP507 and TP509, TP508 and TP510. |
| Set 72 | TP573 TP574 | VR571 VR572 | 775mV | |
| Set 74 | TP575 TP576 | VR575 VR576 | So that a +6.5dB boost is obtained when dolby is switched from off to dolby-C. | • Attach the jig shown in Fig. 1 and adjust. |
| | TP575 TP576 | VR573 VR574 | So that a +11dB ±0.25dB boost is obtained when dolby is switched from off to dolby-C. | • Repeat the high level stage and low level stage adjustments 2–3 times. |
| Set 74 | TAPE OUT | VR505 VR506 | So that frequency response is flat. | • Attach the jig shown in Fig. 2 and adjust.<br>• Dolby B is on. |
| e Hz | TAPE OUT | VR503 VR504 | So that frequency response is flat. | • Dolby C is on.<br>• Make this adjustment for dolby-B first, then recheck dolby-B after adjusting dolby-C. |
| | TP203 TP204 | LC201 LC202 | Maximum output | • Bias fine trim control is hi cut.<br>• Bias selector is metal position.<br>• Turn the VR671 maxmum clockwise and VR672 maximum counter-clockwise position.<br>• Repeat adjustments 1 and 2, then do them again after completing adjustment 3. |
| | TP203 TP204 | L671 L672 | Maximum output | |
| | TP205 TP206 | LC203 LC204 | Minimum output | |
| | TP501 TP502 | L101 L103 L102 L104 | Minimum output | • Bias selector is metal position.<br>• Short the TP507 and TP509, TP508 and TP510.<br>• Attach the jig shown in Fig. 3 and adjust.<br>• Adjust L101/L102 and L103/ L104 in alternation. |

| STEP | ADJUSTMENT ITEM | INSTRUMENT REQUIRED | MODE | INPUT SIGNAL | POINT TO BE CONNECTED | ADJUST POINT | RATING | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 11 | Peaking coil (Pre-adjustment) | VTVM | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP203 and TP204 voltage is 1mV. Then, adjust with 25kHz signal. | TP203 TP204 | L201 L202 | Maximum output | Short the TP251 to ground. |
| 12-1 | Record equalizer (Pre-adjustment) | VTVM | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP203 and TP204 voltage is 1mV (at each position of bias selector). Then, adjust with a 8kHz signal. | TP203 TP204 | VR207 VR208 | 2.3mV | • Bias and equalization selectors are metal position. • Short the TP251 and ground. |
| 12-2 | | | | | TP203 TP204 | VR209 VR210 | 1.95mV | • Bias and equalization selectors are $CrO_2$ position |
| 12-3 | | | | | TP203 TP204 | VR205 VR206 | 2.25mV | • Bias and equalization selectors are FeCr position. |
| 12-4 | | | | | TP203 TP204 | VR203 VR204 | 1.45mV | • Bias and equalization selectors are LN position. |
| 13 | Bias level (Pre-adjustment) | VTVM Blank tape (AC-711) | REC/PB | Apply 1kHz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −25dB when REC-PAUSE mode. | TP501 TP502 | VR671 VR672 | Maximum output | • HX-PRO switch is on position. • Bias and equalization selectors are metal position. |
| 14 | Record level (Pre-adjustment) | VTVM Blank tape (AC-711) | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −25dB when REC-PAUSE mode. | TP501 TP502 | VR201 VR202 | 775mV −25dB | • HX-PRO switch is on position. • Bias and equalization selectors are metal position. |
| 15 | Record/playback equalizer frequency characteristic (Pre-adjustment) | VTVM Blank tape (AC-711) | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal. | TAPE OUT | VR671 VR672 L201 L202 | So that the record/playback frequency response is flat. (※) | • HX-PRO switch is on position. • Bias and equalization selectors are metal position. |
| 16-1 | Record/playback equalizer frequency characteristic | VTVM Blank tape (LN XL-I; FeCr CS-30; $CrO_2$ AC-512; metal AC-711) | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal. | TAPE OUT | VR253 L202 VR671 L201 | So that the record/playback frequency response is flat. (※) | • HX-PRO switch is on position. • Bias and equalization selectors are $CrO_2$ position. |
| 16-2 | | | | | | | | |
| 16-3 | | | | | TAPE OUT | | • Confirm record/playback frequency response. • If the frequency response is not flat do the adjustment over starting with step 15.(※) | • HX-PRO switch is on position. • Bias and equalization selectors are metal position. |
| 16-4 | | | | | | VR207 | So that the record/playback frequency response is flat. (※) | |
| 16-5 | | | | | TAPE OUT | VR252 | So that the record/playback frequency response is flat. (※) | • HX-PRO switch is on position. • Bias and equalization selectors are FeCr position. |
| 16-6 | | | | | | VR205 | | |
| 16-7 | | | | | TAPE OUT | VR251 | So that the record/playback frequency response is flat. (※) | • HX-PRO switch is on position. • Bias and equalization selectors are LN position. |
| 16-8 | | | | | | VR203 | | |
| 16-9 | | | | | TAPE OUT | VR673 VR674 | So that the record/playback frequency response is flat. (※) | • Bias and equalization selectors are $CrO_2$ position. |
| 16-10 | | | | | | | • Confirm record/playback frequency response. • If frequency response is not the same as for step 16-9, adjust while watching the balance of the two. | • Bias and equalization selectors are LN position. |
| 17 | Record level | VTVM Blank tape (AC-512) | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV when REC-PAUSE mode. | TP501 TP502 | VR201 VR202 | 775mV | • Bias and equalization selectors are $CrO_2$ position. |
| 18 | Record/playback equalizer frequency characteristic confirmation | VTVM Blank tape (LN XL-I; FrCr CS-30; $CrO_2$ AC-512; metal AC-711) | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal. | TAPE OUT | | • Confirm record/playback frequency response is within specifications. • If specification are not met, redo the adjustments on steps from 11 to 16. | • This confirmation should be done at each bias and equalization positions under each of the following conditions Dolby B, Dolby C,Dolby B and HX-PRO ON, Dolby C and HX-PRO ON. |
| 19 | Record calibration tone level | VTVM | REC-PAUSE | | TP573 TP574 | VR471 | 775mV | • Keep pressing the RECORD CAL TONE button. • Adjust balance if there is a difference in output between the R and L channels. |
| 20 | Bias tone | VTVM | REC-PAUSE | | TP573 TP574 | VR472 VR473 | 775mV −25dB | • Keep the BIAS TONE button pressed. |
| 21 | Meter level | VTVM | REC-PAUSE | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −0.5dB when REC-PAUSE mode. | | VR401 VR402 | Adjust to the point where the 0 VU LED of the LED display lights dimly. | • Output level control at center. • Connect a 10kΩ load resistor to TAPE OUT. |

(※) Measurement is satisfactory if it is within the record/playback frequency response range specified for dolby off. But adjust it as close to flat as possible.

| STEP | ADJUSTMENT ITEM | INSTRUMENT REQUIRED | MODE | INPUT SIGNAL | POINT TO BE CONNECTED | ADJUST POINT |
|---|---|---|---|---|---|---|
| 11 | Peaking coil (Pre-adjustment) | VTVM | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP203 and TP204 voltage is 1mV. Then, adjust with 25kHz signal. | TP203<br>TP204 | L201<br>L202 |
| 12-1 | Record equalizer (Pre-adjustment) | VTVM | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP203 and TP204 voltage is 1mV (at each position of bias selector). Then, adjust with a 8kHz signal. | TP203<br>TP204 | VR207<br>VR208 |
| 12-2 | | | | | TP203<br>TP204 | VR209<br>VR210 |
| 12-3 | | | | | TP203<br>TP204 | VR205<br>VR206 |
| 12-4 | | | | | TP203<br>TP204 | VR203<br>VR204 |
| 13 | Bias level (Pre-adjustment) | VTVM<br>Blank tape (AC-711) | REC/PB | Apply 1kHz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −25dB when REC-PAUSE mode. | TP501<br>TP502 | VR671<br>VR672 |
| 14 | Record level (Pre-adjustment) | VTVM<br>Blank tape (AC-711) | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −25dB when REC-PAUSE mode. | TP501<br>TP502 | VR201<br>VR202 |
| 15 | Record/playback equalizer frequency characteristic (Pre-adjustment) | VTVM<br>Blank tape (AC-711) | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal. | TAPE OUT | VR671<br>VR672<br>L201<br>L202 |
| 16-1 | Record/playback equalizer frequency characteristic | VTVM<br>Blank tape<br>(LN XL-I; FeCr CS-30; $CrO_2$ AC-512; metal AC-711) | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal. | TAPE OUT | VR253<br>L202 |
| 16-2 | | | | | | VR671<br>L201 |
| 16-3 | | | | | TAPE OUT | |
| 16-4 | | | | | | VR207 |
| 16-5 | | | | | TAPE OUT | VR252 |
| 16-6 | | | | | | VR205 |
| 16-7 | | | | | TAPE OUT | VR251 |
| 16-8 | | | | | | VR203 |
| 16-9 | | | | | TAPE OUT | VR673<br>VR674 |
| 16-10 | | | | | | |
| 17 | Record level | VTVM<br>Blank tape (AC-512) | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV when REC-PAUSE mode. | TP501<br>TP502 | VR201<br>VR202 |
| 18 | Record/playback equalizer frequency characteristic confirmation | VTVM<br>Blank tape<br>(LN XL-I; FrCr CS-30; $CrO_2$ AC-512; metal AC-711) | REC/PB | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −25dB when REC-PAUSE mode. Then, adjust with a 20Hz to 30kHz sweep signal. | TAPE OUT | |
| 19 | Record calibration tone level | VTVM | REC-PAUSE | | TP573<br>TP574 | VR471 |
| 20 | Bias tone | VTVM | REC-PAUSE | | TP573<br>TP574 | VR472<br>VR473 |
| 21 | Meter level | VTVM | REC-PAUSE | Apply 400Hz signal to LINE INPUT LOW. Set LINE LEVEL knob so that TP573 and TP574 voltage is 775mV −0.5dB when REC-PAUSE mode. | | VR401<br>VR402 |

| OINT TO BE ONNECTED | ADJUST POINT | RATING | REMARKS | |
|---|---|---|---|---|
| TP203<br>TP204 | L201<br>L202 | Maximum output | Short the TP251 to ground. | |
| TP203<br>TP204 | VR207<br>VR208 | 2.3mV | • Bias and equalization selectors are metal position. | • Short the TP251 and ground. |
| TP203<br>TP204 | VR209<br>VR210 | 1.95mV | • Bias and equalization selectors are $CrO_2$ position | |
| TP203<br>TP204 | VR205<br>VR206 | 2.25mV | • Bias and equalization selectors are FeCr position. | |
| TP203<br>TP204 | VR203<br>VR204 | 1.45mV | • Bias and equalization selectors are LN position. | |
| TP501<br>TP502 | VR671<br>VR672 | Maximum output | • HX-PRO switch is on position.<br>• Bias and equalization selectors are metal position. | |
| TP501<br>TP502 | VR201<br>VR202 | 775mV −25dB | • HX-PRO switch is on position.<br>• Bias and equalization selectors are metal position. | |
| TAPE OUT | VR671<br>VR672<br>L201<br>L202 | So that the record/playback frequency response is flat. ( ※ ) | • HX-PRO switch is on position.<br>• Bias and equalization selectors are metal position. | |
| TAPE OUT | VR253<br>L202 | So that the record/playback frequency response is flat. ( ※ ) | • HX-PRO switch is on position.<br>• Bias and equalization selectors are $CrO_2$ position. | |
| | VR671<br>L201 | | | |
| TAPE OUT | | • Confirm record/playback frequency response.<br>• If the frequency response is not flat do the adjustment over starting with step 15.(※) | • HX-PRO switch is on position.<br>• Bias and equalization selectors are metal position. | |
| | VR207 | So that the record/playback frequency response is flat. ( ※ ) | | |
| TAPE OUT | VR252 | So that the record/playback frequency response is flat. ( ※ ) | • HX-PRO switch is on position.<br>• Bias and equalization selectors are FeCr position. | |
| | VR205 | | | |
| TAPE OUT | VR251 | So that the record/playback frequency response is flat. ( ※ ) | • HX-PRO switch is on position.<br>• Bias and equalization selectors are LN position. | |
| | VR203 | | | |
| TAPE OUT | VR673<br>VR674 | So that the record/playback frequency response is flat. ( ※ ) | • Bias and equalization selectors are $CrO_2$ position. | |
| | | • Confirm record/playback frequency response.<br>• If frequency response is not the same as for step 16-9, adjust while watching the balance of the two. | • Bias and equalization selectors are LN position. | |
| TP501<br>TP502 | VR201<br>VR202 | 775mV | • Bias and equalization selectors are $CrO_2$ position. | |
| TAPE OUT | | • Confirm record/playback frequency response is within specifications.<br>• If specification are not met, redo the adjustments on steps from 11 to 16. | • This confirmation should be done at each bias and equalization positions under each of the following conditions Dolby B, Dolby C,Dolby B and HX-PRO ON, Dolby C and HX-PRO ON. | |
| TP573<br>TP574 | VR471 | 775mV | • Keep pressing the RECORD CAL TONE button.<br>• Adjust balance if there is a difference in output between the R and L channels. | |
| TP573<br>TP574 | VR472<br>VR473 | 775mV −25dB | • Keep the BIAS TONE button pressed. | |
| | VR401<br>VR402 | Adjust to the point where the 0 VU LED of the LED display lights dimly. | • Output level control at center.<br>• Connect a 10kΩ load resistor to TAPE OUT. | |

( ※ ) Measurement is satisfactory if it is within the record/playback frequency response range specified for dolby off. But adjust it as close to flat as possible.

## ■ MECHANISM ADJUSTMENT AND CONFIRMATION

| ITEM | TOOLS USED | ADJUSTMENT POINT | STANDARD | REMARKS |
|---|---|---|---|---|
| Head height position adjustment | Head gauge MAZ-0057 (chip MAZ-0181(C)) M-300 (chip MAZ-0180(D)) | Adjustment screws A, B, C and D (Fig. 1) | Confirm alignment with head gauge. (Fig. 1) | Adjustment washer Thickness Part No. 0.1mm 2410-5017 0.2mm 2410-5018 0.3mm 2410-5019 |
| Head position adjustment (PLAY) | Head gauge MAZ–0057/ M–300 | Adjustment screw C, D, E and F (Fig. 2) | Record/playback head, 0–MAX; erase head, MIN–0 | |
| Head position adjustment (AUTO SCAN) | Head gauge MAZ-0057 (chip MAZ-0181(A)) /M-300 (chip MAZ-0181(B)) | Adjustment screws E and F (Fig. 4) | Record/playback head, 0–MAX (as close to 0 as possiple) | Repeat steps 2 and 3 |
| Pinch roller pressure adjustment | Dial tension gauge (1,000g.) | Lever (Fig. 6) | 350g | |
| Back tension adjustment | Cassette torque meter (TW-2111) | Back tension lever | 5.5gcm | |
| Take-up torque confirmation | Cassette torque meter (TW-2111) | | 50gcm | Replace clutch if torque is not within limits as per VR851. |
| FF, REW torque confirmation | Dial torque gauge (300gcm) | | 130gcm | |
| Brake torque confirmation | Dial torque gauge (90gcm) | | 120gcm | Measure in clockwise direction for take-up reel, in counter-clckwise direction for supply reel. |
| Capstan spindle back clearance confirmation | | | | Fig. 9 |
| Tape travel confirmation | Mirror cassette (MTT-902) | | Confirm that the tape, erase and Record/playback heads, pinch roller, and capstan are properly positioned. | |

### ■HEAD HEIGHT ADJUSTMENT

**●PURPOSE**

The tape guides not only determine the route of tape travel, but act to limit up/down movement of the tape. Therefore, they must be carefully adjusted to avoid damage to the tape edges or abnormal travel.

**●INSPECTION PROCEDURE**

1. Insert the head gauge and place the unit in the PLAY state.
2. Make sure that the adjustment chip is not in contact with the tape guides of both heads.

**●ADJUSTMENT PROCEDURE**

Adjust as follows if either of the adjustment chips catch on the tape guides.

*In case of record/playback head, adjust by turning adjustment screws A or B. Both adjustment screws should be turned in the same direction.
In case of erase head, loosen the adjustment screw C and D and insert an adjusting washer under the head.

**[NOTES]**

1. Ensure that the head gauge is firmly set in place.

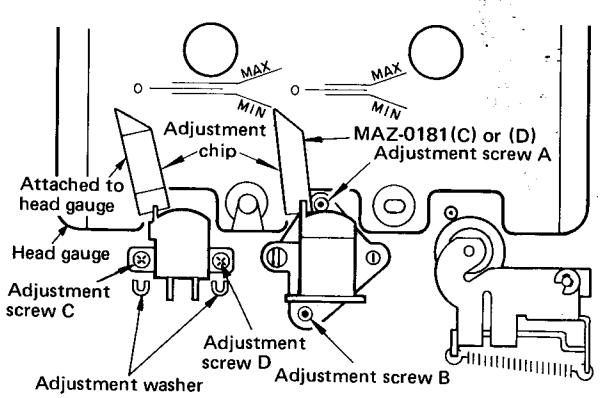



Fig. 1

## ■ HEAD ADJUSTMENT (PLAY state)

**●PURPOSE**

The heads must move when the unit is switched from STOP to PLAY or REC.. The position of the heads with relation to the cassette at such time is determined according to the cassette standards. Lack of proper contact with the tape will result if the heads are moved too far or not far enough; therefore, head positioning must be adjusted very carefully.

**●INSPECTION PROCEDURE**

1. Insert the head gauge and place the unit in the PLAY state.
2. The heads are properly positioned if the ends of the adjustment chips are within the specified range when they are perpendicular to and in light contact with the centers of the heads.
   Record/Playback head: 0–MAX
   Erase head: MIN–0

**●ADJUSTMENT PROCEDURE**

Loosen adjustment screws C–F to adjust head positioning.
(Be careful to ensure that the heads are not tilted.)

**[NOTES]**

Confirm that the head gauge is pressed in the direction indicated by the arrow ( ⇩ ) when it is inserted.

**●FOR REFERENCE**

Relationship between head position and MAX–MIN on the head gauge.
The position in which the heads are installed is specified as shown in Figure 3 above. Use the head gauge to ensure that the heads are positioned within the indicated ranges when they are installed.
Relationship between specified ranges and MAX–0–MIN on the head gauge.

**RECORD/PLAYBACK HEAD**

MAX position: 3.1 (–0.25 of tolerance)
0 position: 3.35 (center)
MIN position : 3.8 (+0.45 of tolerance)

**ERASE HEAD**

MAX position: 3.3 (–0.2 of tolerance)
0 position: 3.5 (center)
MIN position: 4.0 (+0.5 of tolerance)

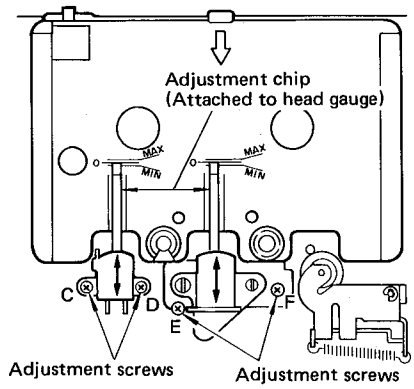



Fig. 2

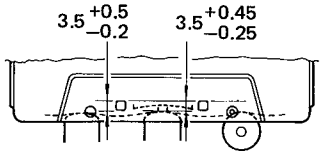



Fig. 3

## ■ HEAD ADJUSTMENT (AUTO-SCAN)

**●PURPOSE**

The head position must be adjusted to ensure that the tape signal is correctly detected during auto scan operation. If the Record/playback head moves out too far the tape will not be taken up properly, while if it does not move out far enough the tape signal will not be detected.

**●INSPECTION PROCEDURE**

1. Insert the head gauge and place the unit in the AUTO-SCAN state.
2. Ensure that the end of the adjustment chip is within the specified range when it is perpendicular to and in light contact with the center of the Record/playback head.
   Record/playback head: 0–MAX

**●ADJUSTMENT PROCEDURE**

1. Loosen the adjustment screws and adjust the head position in the same manner as for PLAY. However, be sure to recheck the PLAY position of the head after doing this.
2. If specifications cannot be satisfied for both the PLAY and SCAN states, make fine adjustments by bending the lever shown in Fig. 5 at the point marked※.

**[NOTES]**

1. Ensure that the head gauge is securely inserted.
2. Although the adjustment range is given as 0–MAX, the adjustment should be as close to 0 as possible. However, it must not be less than 0.

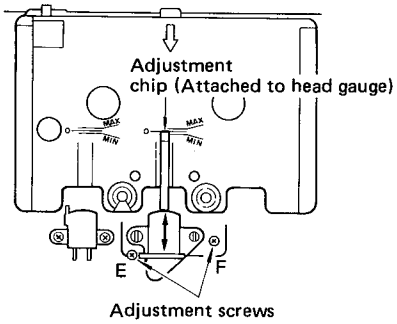



Fig. 4

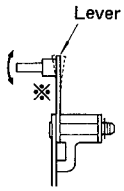



Fig. 5

## ■ PINCH ROLLER ADJUSTMENT

**●PURPOSE**

High tape tension is obtained when the pinch roller pressure is high. However, an excessive load is exerted on the spindle bearings of the capstan and the pinch roller if the pressure is too high. This can result in destructive side pressure which will shorten the life of the spindle bearings and cause wow and flutter. Further, the rubber contact surface of the pinch roller is excessively deformed in such cases, and the resulting variations in hardness can also produce wow and flutter and hasten deterioration of the rubber.
If the amount of pressure is too small, wow and flutter can result due to slipping; therefure, the pressure must be adjusted to within the range which will give stable tape speed.

**●INSPECTION PROCEDURE**

1. Place the unit in the PLAY state and confirm that the gap between the pinch roller and the level is 0.3 mm ± 0.1 mm.

2. With the unit in the PLAY state, apply the dial tension gauge to the pinch roller spindle and exert pressure in the direction indicated by the arrow ( ) for a distance of about 0.2mm (to the point where the pinch roller stops turning). Then, gradually return the gauge in the opposite direction ( ) and confirm that the pinch roller starts turning when the tension gauge reads 350g. ± 30g.

**●ADJUSTMENT PROCEDURE**

Inspection item 1... Adjust by moving the section of the lever to the right or left (↔).

Inspection item 2... Adjust by bending the section of the lever in the direction indicated by the arrow ( ). Pressure is increased if this section of the lever is bent to the left ( ), and reduced if it is bent to the right ( ).

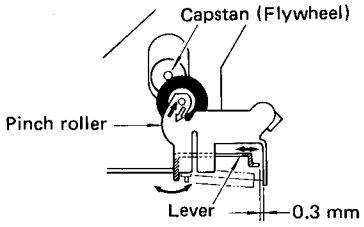



Fig. 6

## ■ BACK TENSION ADJUSTMENT

**●PURPOSE**

Back tension is applied during PLAY to improve contact between the tape and the head. If back tension is insufficient, the tape is jerked when the unit is switched to PLAY and tape speed will be uneven while the resulting slack is taken up. If back tension is too great, the tape is subjected to excessive tension which can stretch it or cause the capstan drive to slip (resulting in wow just before slippage occurs). If back tension on the supply reel spindle is not even, wow becomes particularly pronounced as the end of the tape is neared because the relative amount of back tension is increased.

**●INSPECTION PROCEDURE**

1. Clean the reel spindles (both supply and take up) with freon.
2. Use a jig (MAZ-0192) to age the mechanism (place the unit in the PLAY state for approximately 5 seconds).
3. Insert the cassette torque meter in the mechanism and place it in the PLAY state.
4. Confirm that the torque meter reads 5.5gcm ± 1gcm. at this time.

**●CHECK ITEMS**

Check the following when the torque meter reading is not as specified.

1. Visually confirm that gap (a) in Fig. 7 is approximately 0.4mm while the unit is in the PLAY state.
2. Visually confirm that gap (b) in Fig. 7 is approximately 0.4mm while the unit is in the CUE state.

**●ADJUSTMENT PROCEDURE**

1. When gap (a) is not as specified while the unit is in the PLAY state, adjust is by bending the section of the back tension lever in the direction indicated by the arrow ( ).
2. When gap (b) is not as specified while the unit is in the CUE state, adjust it by bending the section of the back tension lever in the direction indicated by the arrow ( ).

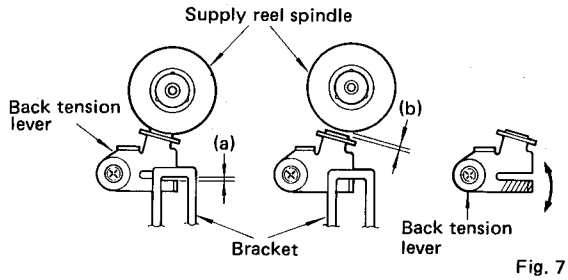



Fig. 7

## ■ TAKE-UP TORQUE CONFIRMATION

**●PURPOSE**

Take-up torque must be applied to the reel spindle to ensure that the tape is taken up at a constant speed. If the take-up torque is too high, the tape will be subjected to excessive tension and become stretched or curled, or the tape travel position will change, resulting in wrinkling or damage to the edge of the tape. However, if the take-up torque is too low the tape will become loose and may not be wound up evenly.

**●INSPECTION PROCEDURE**

Replace the clutch if no slippage occurs and the take-up torque is not within specifications as per VR851.

**[NOTES]**

Check whether the torque meter reading on the take-up side varies by more than ±5 g—cm as the reel spindle goes through one revolution. If so, the drive section is dirty and should be cleaned with freon or the like. Repeat the check after cleaning.

## ■ F. FWD AND REW. TORQUE CONFIRMATION

**●PURPOSE**

To confirm that the tape is taken up correctly.

**●INSPECTION PROCEDURE**

1. Place the unit in the FF and REW states.
2. Slip the dial torque gauge vertically onto the reel spindle, holding the gauge with the fingers so that "0" marks are aligned.
3. After slipping the gauge onto the reel spindle, gradually move your finger away from the rotating part at the bottom (the part marked ※in Fig. 8).
4. Confirm that dial torque gauge reads 130gcm ± 20gcm.

**[NOTES]**

1. Hold the dial gauge so that there is a gap between it and the reel spindle as shown in the figure.
2. Attach a cassette hub to the tip of the gauge (to its center).
3. Usually, low FF or REW torque readings are due to grease or dirt on the drive section; therefore, this section should be cleaned with freon or the like before taking the readings.

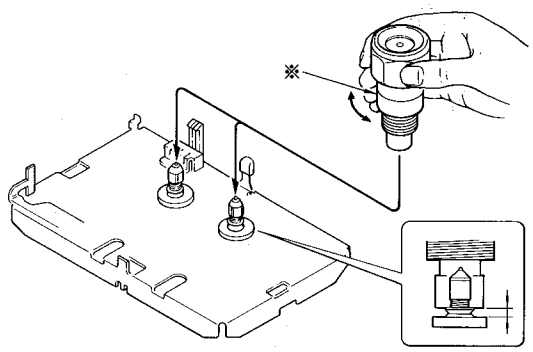



Fig. 8

## ■ BRAKE TORQUE CONFIRMATION

**●PURPOSE**

The function of the brake is to stop the tape as quickly and surely as possible without subjecting it to excessive tension or allowing it to become slack when switching from FF, REW, or PLAY to STOP. However, in order to protect the tape, the brake must not be applied until after the drive force has been removed. Further, greater braking force must be applied to the reel spindle on the supply side than to that on the take-up side in order to prevent the tape from overrunning.

**●INSPECTION PROCEDURE**

1 With the mechanism in the STOP state, slip the dial torque gauge vertically onto the reel spindle.

2 Slowly rotate the top of the dial gauge (in the clockwise direction for the take-up reel and in the counter-clockwise direction for the supply reel) and confirm that it reads 120gcm ± 50gcm when the reel spindle starts turning.

**[NOTES]**

1. Usually, low brake torque readings are due to grease or dirt on the brake shoes or reel spindles; therefore, these sections should be cleaned with freon or the like before taking the readings.
2. If the brakes do not operate smoothly because they have become deformed, they must be repaired or replaced.

## ■ CAPSTAN BACK END CLEARANCE CONFIRMATION

**●PURPOSE**

The capstan is provided with a small amount of clearance at its back end (and the smaller, the better). When the unit is used vertically, the capstan becomes horizontal and vibrates in its own axial direction. This causes wow flutter level variation. To prevent such a situation, a spring is inserted so that the capstan is stabilized with light pressure applied in the axial direction. Without any clearance, friction causes burning. Therefore, the purpose of this inspection is to confirm that a proper clearance is obtained at the back end of the capstan to allow the spring to take effect.

**●INSPECTION PROCEDURE**

1 Pull the capstan in the direction of arrow ⇩ and confirm that the clearance (a) is more than 0.1mm.

2 Push the capstan in the direction of arrow ⇧ and confirm that the clearance (b) is within 0.8mm.

**[NOTES]**

1. When the clearance (a) is made 0 (by pushing the bearing in the direction of the arrow ←----lightly), the flywheel (capstan) must be free from play.
2. When the unit is placed vertically and is set in the play mode, the flywheel pushed by the bearing must maintain smooth and constant revolution at the fixed position.

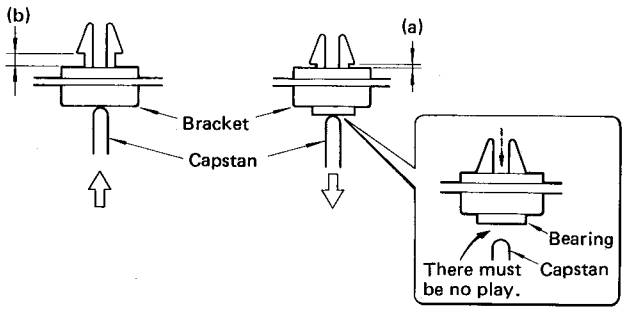



Fig. 9

## ■ TAPE TRAVEL CONFIRMATION

**●PURPOSE**

If the edges of the tape are in constant contact with the tape guides during tape travel, the tape will be subjected to excessive wear and will not be in proper contact with the head; this will result in increased variations in level. Therefore, proper tape travel must be confirmed using the mirror cassette.

**●INSPECTION PROCEDURE**

1. Set the mirror cassette in the mechanism.
2. Place the mechanism in the PLAY state.
3. Confirm that tape travel is as shown in Fig. 11; the tape should not be in contact with the tape guides and should be centered on the pinch roller.
4. Pay particular attention to the splice between the tape leader and the magnetic tape.

**●ADJUSTMENT PROCEDURE**

There is a problem with one of the following if the tape is in contact with the tape guides as shown in Fig. 12 or 13.

- ○Pinch roller perpendicularity
- ○Record/playback head height
- ○Record/playback head angle
- ○Erase head height

a) The pinch roller is at fault if the tape is as shown in Fig. 12.

b) Head height is the problem in the case of Fig. 13.

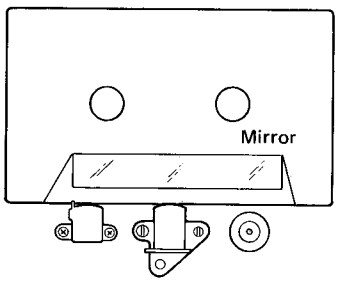



Fig. 10

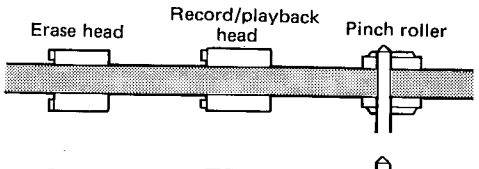



Fig. 11

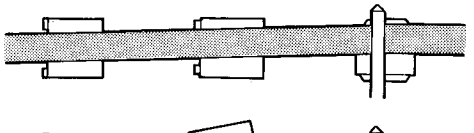



Fig. 12

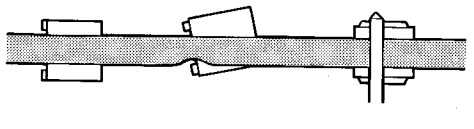
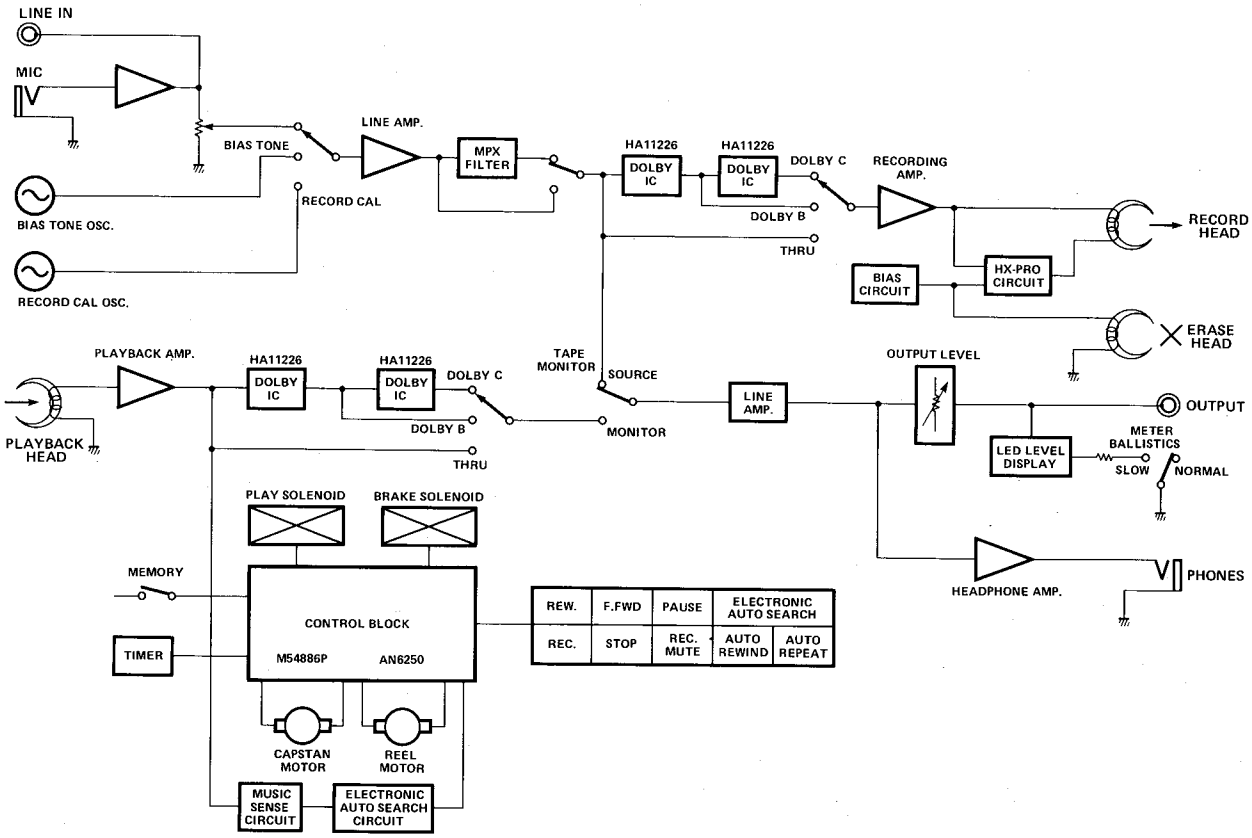



Fig. 13

## BLOCK DIAGRAM




## CIRCUIT DESCRIPTION

**•PLAYBACK MODE (Rch)**

The output of playback head is fed to base of playback amp. (Q 102) and amplified. The output of playback amp. (Q 112) is fed to 15 pin of the dolby IC (IC 502). At Dolby-B mode, the noise reduction is done with one channel of dolby IC (IC 502).

At Dolby-C mode, further the other channel is used.

After noise reduction, the signal is amplified in the line amp. (Q 302, 304, 306, 308) and through output variable resistor (VR302), line out signal is gained.

**•RECORDING MODE (Lch)**

Mic. input is fed to the base of mic amp. (Q 151). The output of mic amp. (Q 153) and line input through the line amp. (Q 571, 573) and MPX filter. The output of MPX filter is fed to 2 pin of dolby IC (IC 503). After noise reduction, signal is fed to the recording amp. (IC 201). The output of recording amp. (IC 201) is added to the bias current bias osc. block through HX-PRO circuit and fed to the record head.

**•MUTING**

At playback and recording mode the muting control voltage is taken out from 15 pin (at playback or recording mode) and 16 pin (at recording mode) of the tape deck controller (IC 801) and mutes at "low" level.

Q 751 becomes on and Q 757 (Lch) and Q 758 (Rch) become on and mute the output of the line amp. Q 301, 303, 305, 307 (Lch) and Q 302, 304, 306, 308 (Rch). And also Q 753 (Lch) and Q (754) become on and mute the output of playback amp.

To mute recording signal, Q 53, Q 51 and Q 52 become on and Q 759 (Lch) and Q 760(Rch) become on.

**•HX-PRO System**

By varying the bias level to compensate for the different characteristics of the input signal, Active Bias is kept constant, so that this allows natural-sounding recordings of the low frequency region. Also, much higher levels of high frequencies can be recorded.

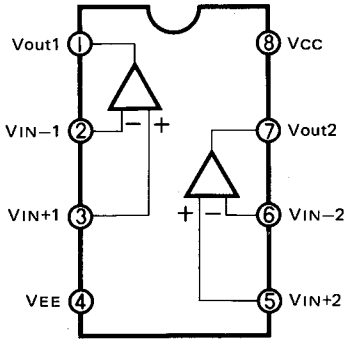
If we consider specific sectors of the frequency range, then, if a signal source only contains high frequency components, the HX-PRO will detect this and reduce the bias from the oscillator to the optimum bias for the signal. On the other hand, no changes in bias level will be made for signal sources that contains only low frequency sounds. However, when low frequency signals contain occasional admixtures of high frequency signals, the HX-PRO will reduce the bias, changing only high frequency bias levels while keeping lower frequency bias level constant. The new system, therefore, not only offers an improvement at high frequencies, but also ensures the optimum bias at low frequencies, too.

**Advantages of the HX-PRO**

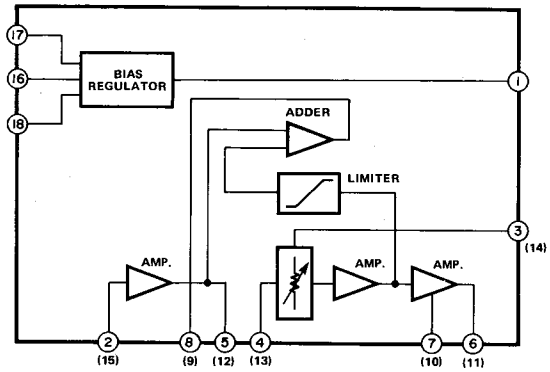
1. Gives performance almost equal to metal tape for normal tape.
2. Outstanding treble dynamic range.
3. Adjustment to left and right channels can be made independently.
4. All kinds of tape from normal through metal are suitable.

# IC FUNCTIONAL BLOCK DIAGRAM

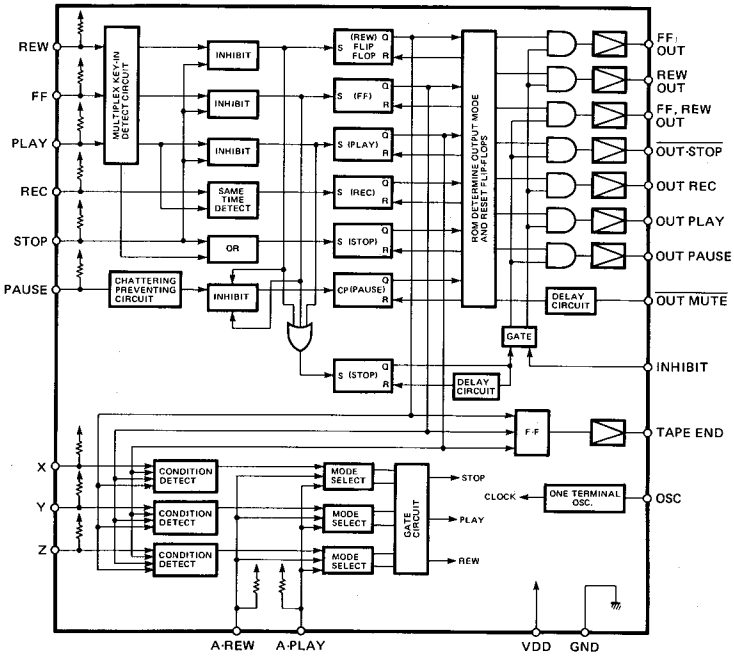
**IC351: NJM 4556D**
**IC421: LA 6458**
**IC471: μPC 4558C**
**IC671, 672: HA 17082PS**
**IC673: NJM 4559D**




**IC501, 502, 503, 504: HA 1126**

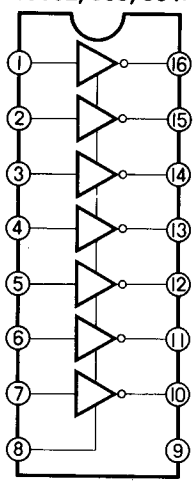



**IC801: TC 9121P**

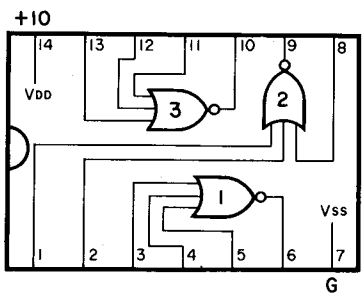



X: Input terminal which orders "stop" or "play" while rewinding. (Set at auto play mode.)
Y: Input terminal which orders "stop" or "rewind" while playing or recording. (Set at auto rewind mode.)
Z: Orders the operation at tape end while auto rewind or auto play.

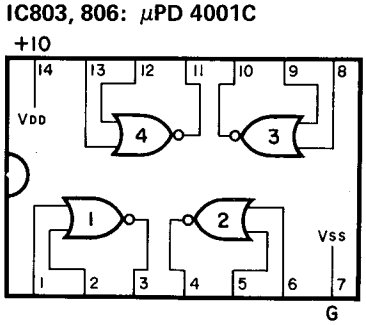
**IC902, 903, 904: IR 2403**



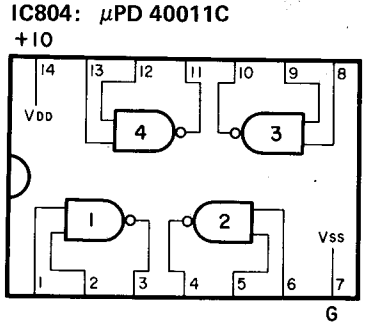
**IC802: μPD 4023C**



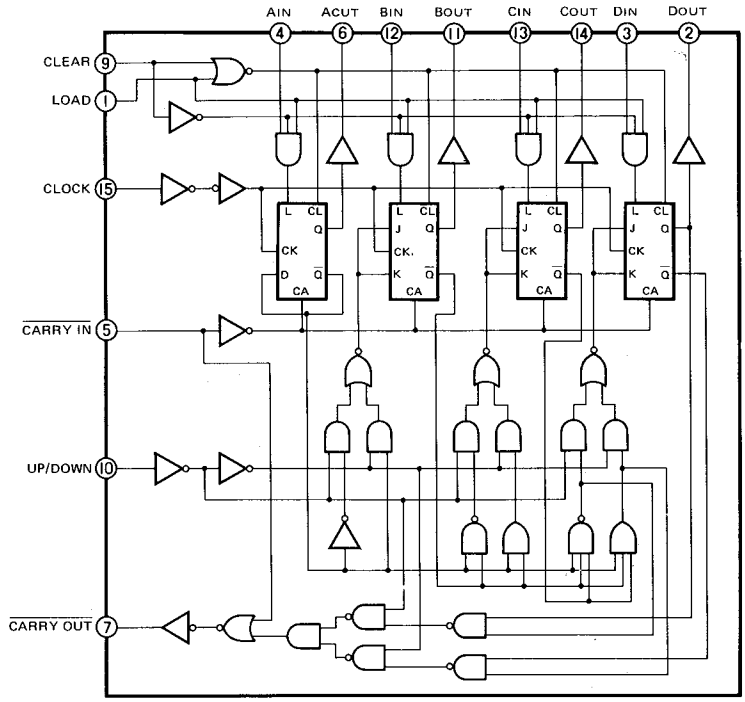

**IC803, 806: μPD 4001C**



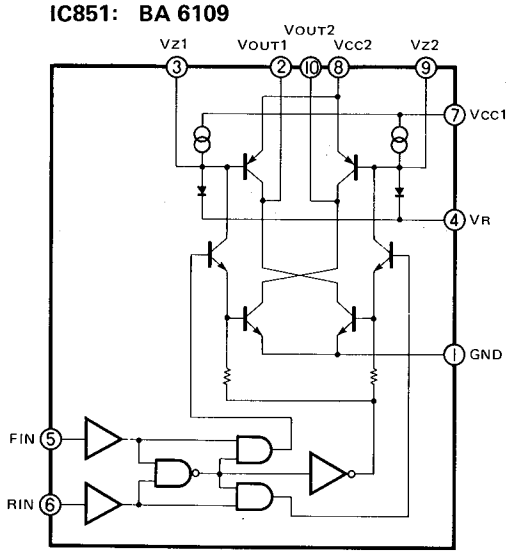

**IC804: μPD 40011C**



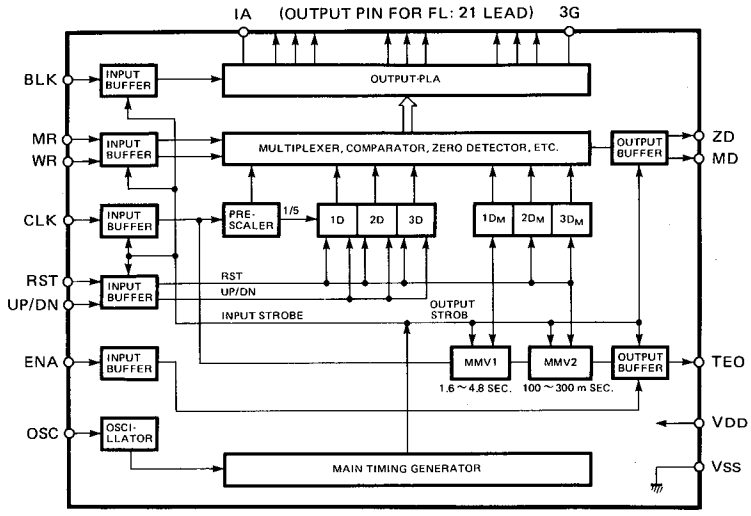
## IC805: μPD 4516C




## IC851: BA 6109




## IC901: TM 3140B




## TM3140B

**(3) OSC (OSCILLATOR-IN)**
Input terminal to generate the internal clock.

**(4) RST (RESET-IN)**
Input terminal to reset the 3 figures counter and the content of memory.

**(5) MR (MEMORY READ-IN)**
Input terminal to appoint displaying the content of memory.

**(6) WR (MEMORY WRITE-IN)**
Input terminal to save the content of counter into memory.

**(7) CLK (CLOCK PULSE-IN)**
Input terminal for the clock pulse of counter.

**(8) UP/DN (UP/DOWN-IN)**
Input terminal to appoint the add and subtract mode of counter.

**(9) ZD (ZERO DETECT-OUT)**
Output terminal to send one-shot signal when counter is in subtract mode and all zero.

**(10) MD (MEMORY DETECT OUT)**
Output terminal to send the one-shot signal when the content of counter sequals that of memory.

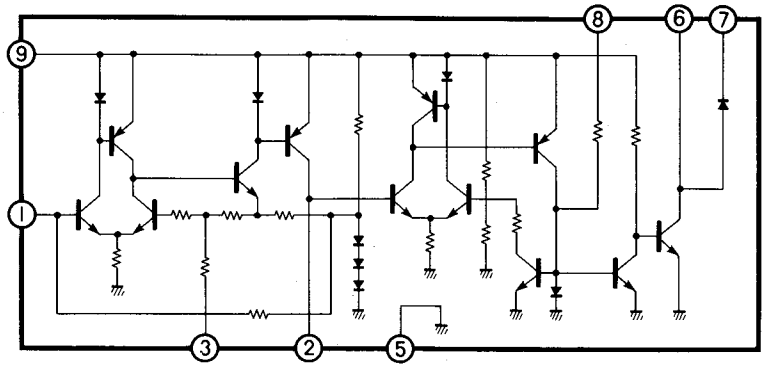
**(11) TEO (TAPE END-OUT)**
Output terminal to detect the tape-end.

**(12) 1A ～3G (SEGMENT-OUT)**
Output terminal to drive segments of 3-figures, 7-segments fluorescent display tube.

**(13) BLK (BLANKING-IN)**
Input terminal to inhibit the 3-fugures output of counter.

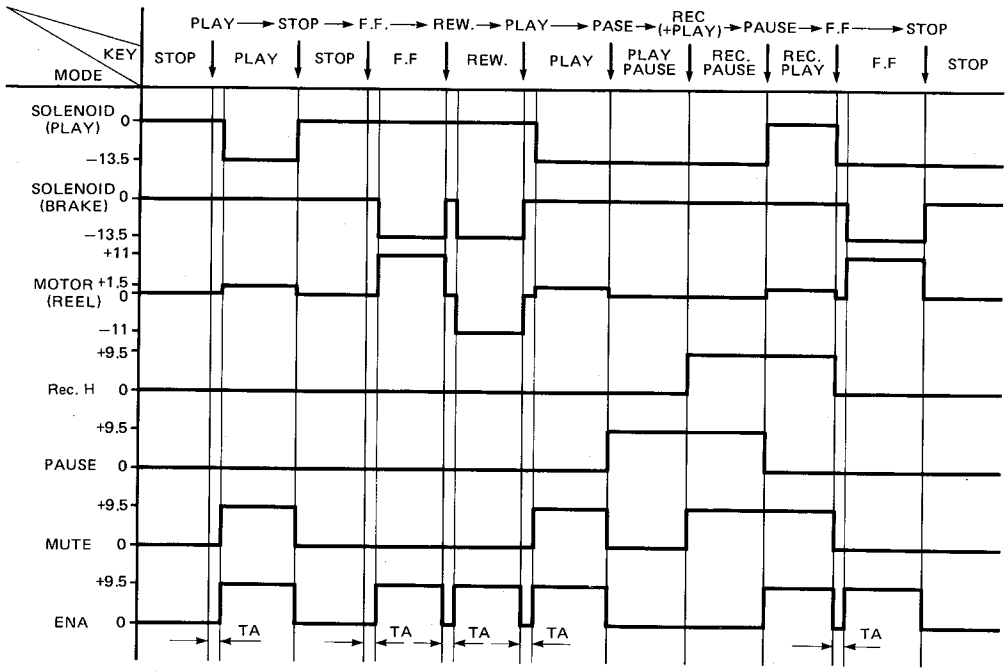
**(14) ENA (TEO ENABLE-IN)**
Input terminal to control TEO output.

## IC951: BA335



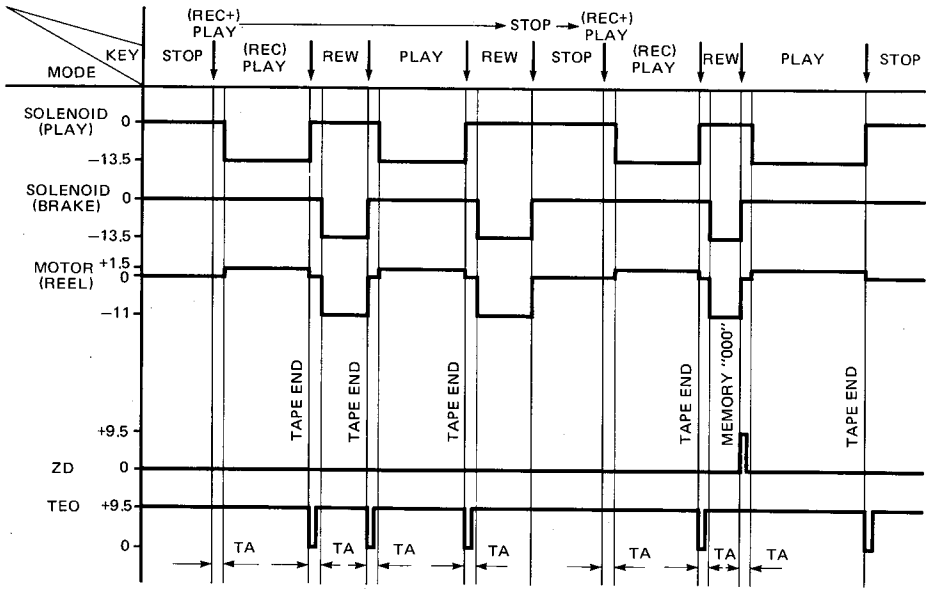
# TIMING CHART

## No. 1 KEY OPERATION MODE



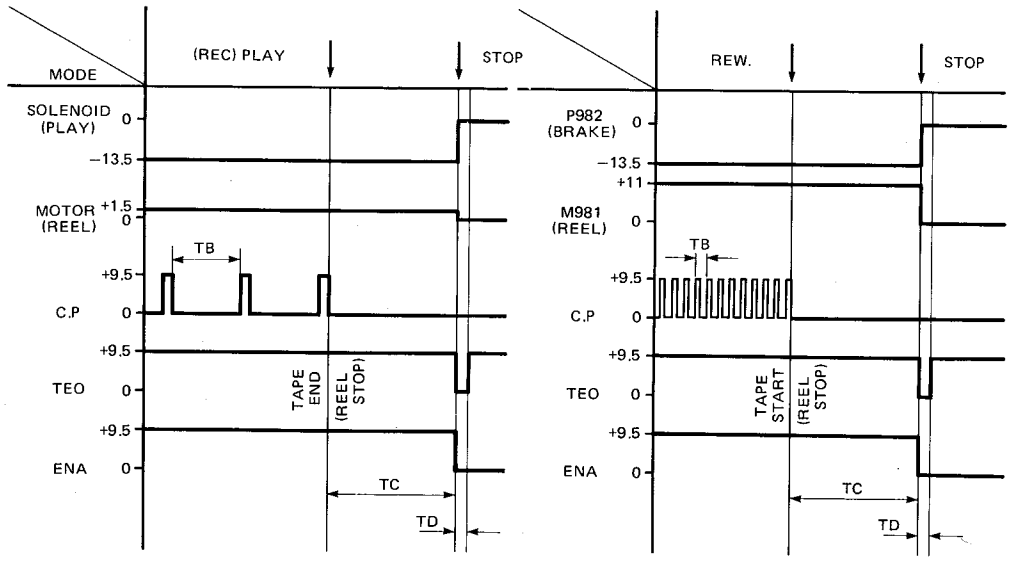

TA = 0.3 sec.

## No. 2 AUTO REPEAT

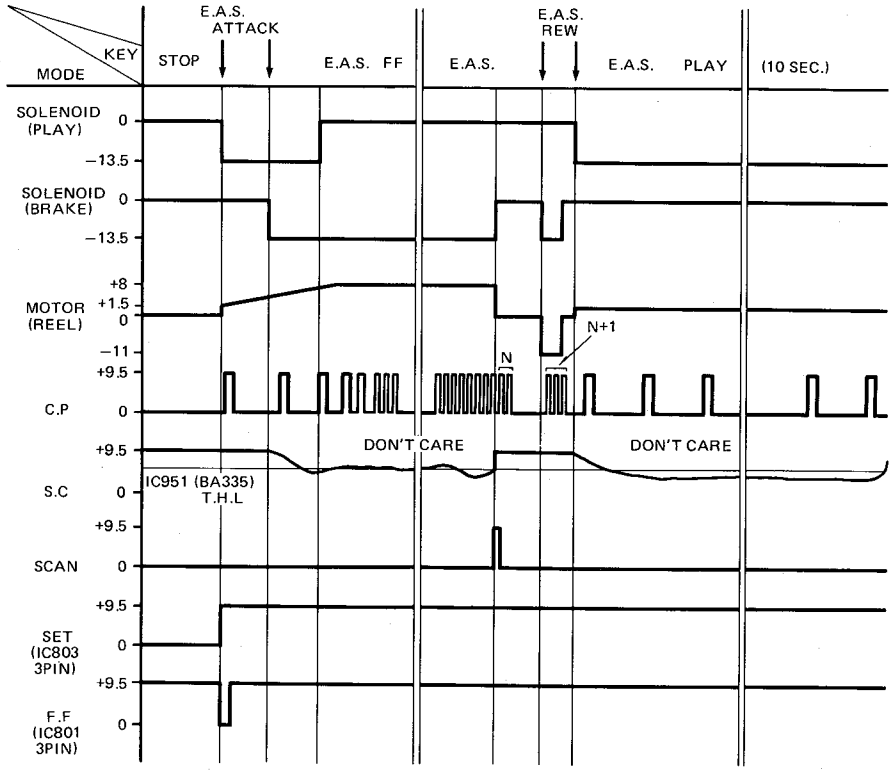



| | | |
|---|---|---|
| • AUTO PLAY REW. | ON | |
| • MEMORY | OFF | |
| • AUTO PLAY REW. | ON | |
| • MEMORY | ON | |
| • AUTO PLAY REW | OFF | |
| • MEMORY | ON or OFF | |

### No. 3 AUTO STOP

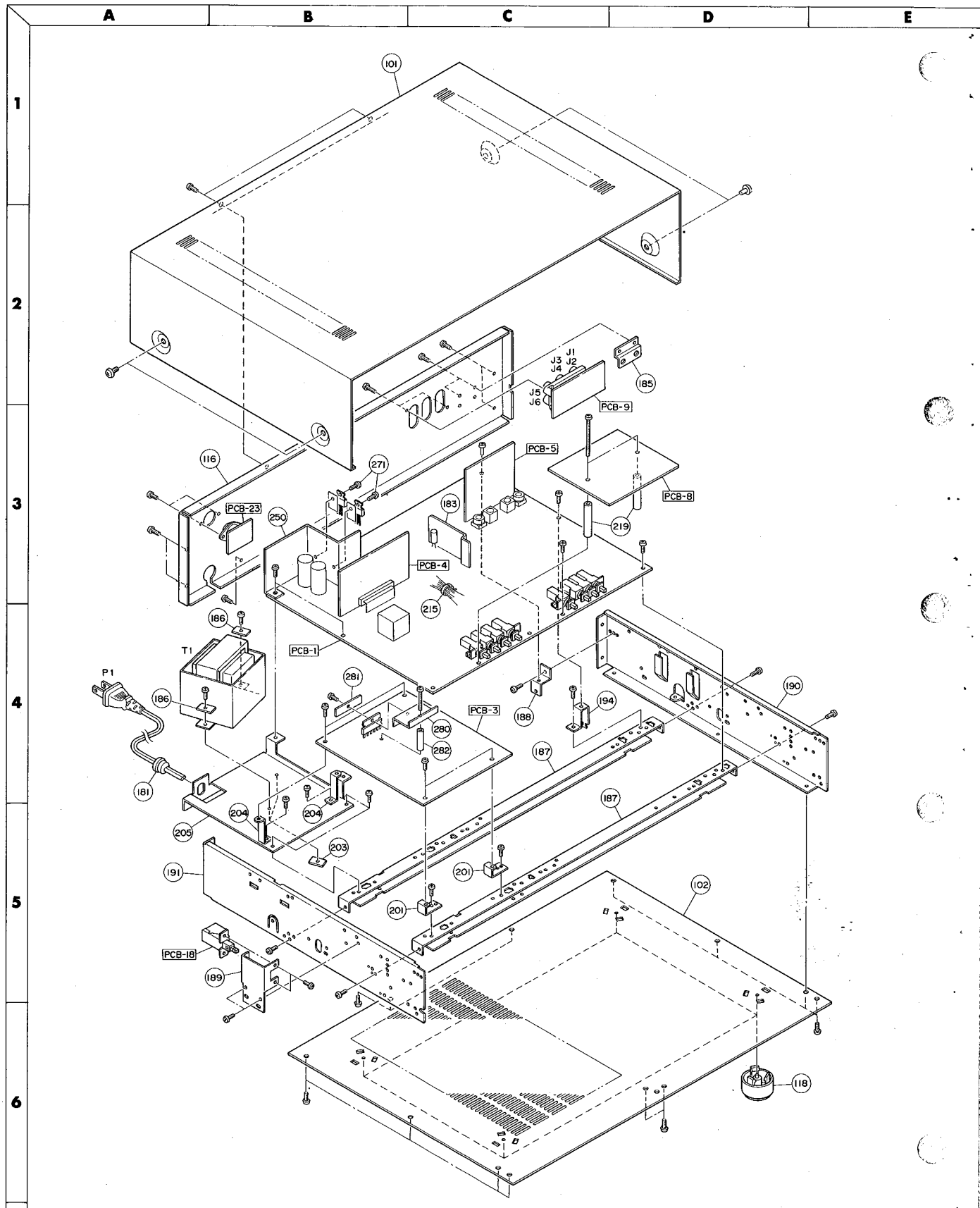


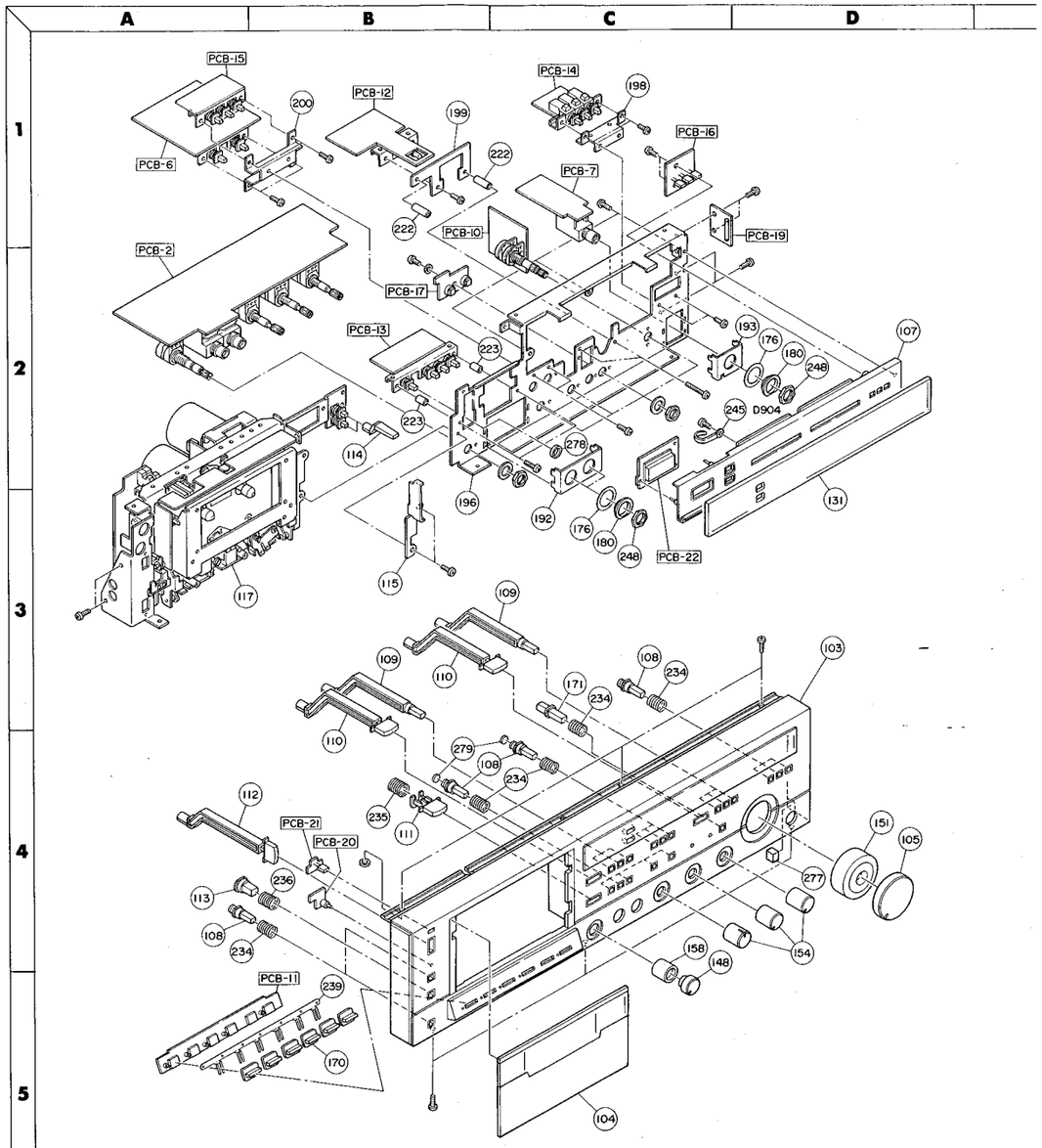

### No. 4 E.A.S.




| | PLAY | F. F | REW. |
|---|---|---|---|
| TA | | 0.3 sec. | |
| TB | 450 ~ 1200 m sec. | 29 ~ 44 m sec. | 17 ~ 65 m sec. |
| TC | | 2.2 ~ 6.7 sec. | |
| TD | | 0.15 ~ 0.45 sec. | |

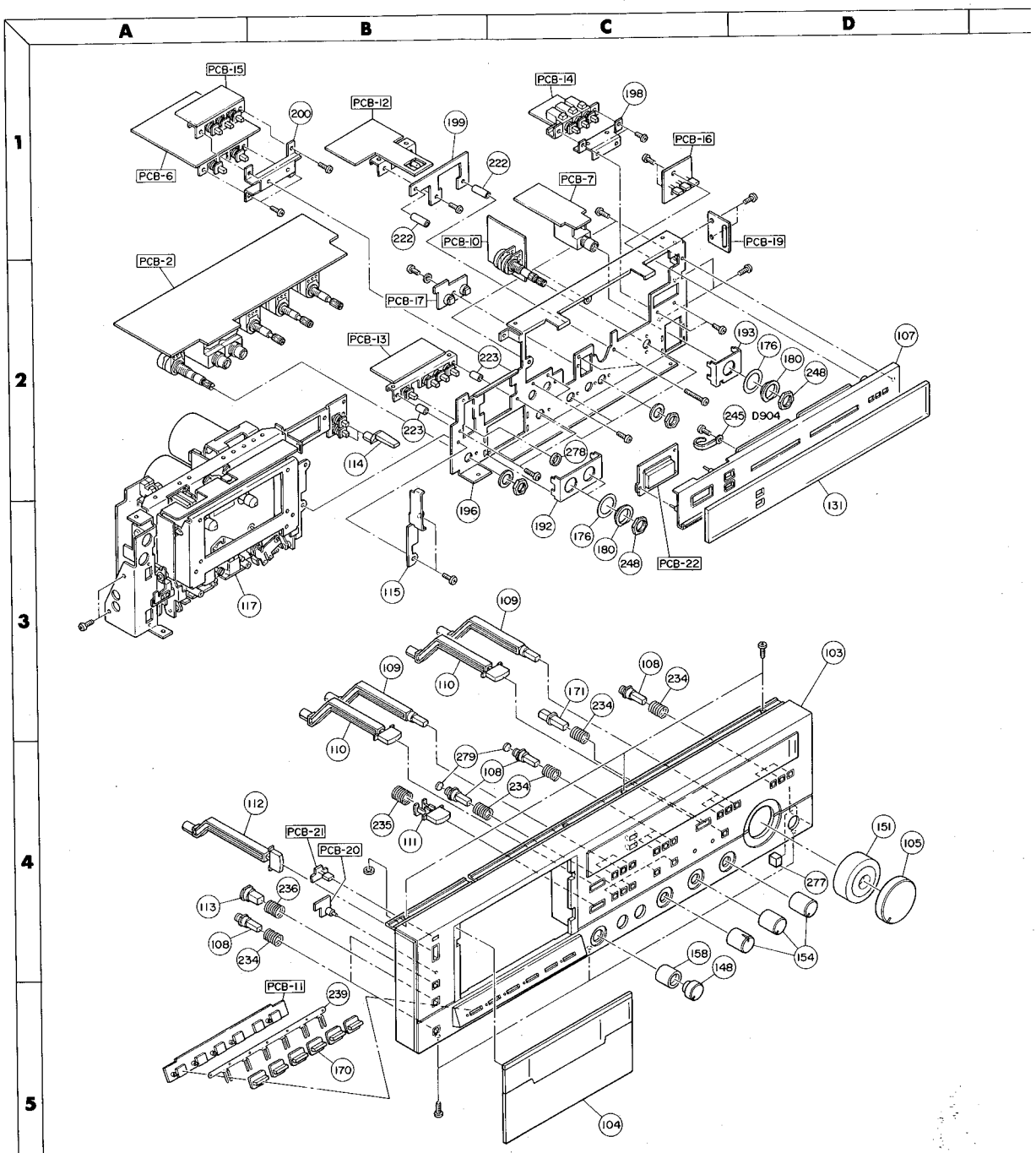
# GENERAL UNIT EXPLODED VIEW






## GENERAL UNIT PARTS LIST

| Ref. No. | Part No. | Description |
|---|---|---|
| 101 | A414-CD401A | Cabinet Top Assembly |
| 102 | A423-CD401A | Cabinet Bottom Assembly |
| 103 | A443-CD401A | Front Panel Assembly |
| 104 | A452-CD401A | Door Assembly |
| 105 | A634-CD401A | Knob Assembly, Line Level (L) |
| 107 | A514-CD401A | Plate Assembly, LED Display Meter |
| 108 | A662-CD401A | Push Button Assembly, Electronic Auto Search, Rec. Mute, Equalization ($CrO_2$, FeCr, LN), Auto Rewind, Auto replay Meter Ballistics, Bias Tone, Record Cal. Tone, Timer |
| 109 | A662-CD401B | Push Button Assembly, Bias ($CrO_2$, FeCr, LN), Dolby NR Type Selector, HX-PRO, MPX Filter |
| 110 | A662-CD401C | Push Button Assembly, Bias (Metal), Dolby NR System Selector |
| 111 | A662-CD401D | Push Button Assembly, Equalization (Metal) |
| 112 | A662-CD401E | Push Button Assembly, Power |
| 113 | A662-CD401F | Push Button Assembly, Eject |
| 114 | A662-CD401G | Push Button Assembly, Memory, Reset |
| 115 | B219-CD401A | Bracket Assembly |
| 116 | B424-CD401A | Cabinet Back Assembly |
| 117 | MR064HF(C) | Cassette Tape Recorder Mechanical Assembly (Basic Assembly Only) |
| 118 | 1319-0139 | Foot |
| 131 | 1441-00302 | Clear Panel |
| 148 | 1630-02001 | Knob, Microphone Level (L) |
| 151 | 1630-01801 | Knob, Line Level (R) |
| 154 | 1630-01901 | Knob, Bias Fine Trim, Output Level, Fader |
| 158 | 1634-03301 | Knob, Microphone Level (R) |
| 170 | 1662-05901VN | Push Button, Record, Rew., Play, F.FWD, Stop, Pause |
| 171 | 1662-08301 | Push Button, Tape Monitor |
| 176 | 2111-1356 | Felt, Microphones Jack, Headphones Jack |
| 180 | 2114-72167 | Bushing, Microphones Jack, Headphones Jack |
| 181 | 2114-415027 | Bushing, AC Line Cord |
| 183 | 2216-7127 | Shield Plate |
| 185 | 2219-7737 | Bracket |
| 186 | 2219-7093 | Bracket |
| 187 | 2219-7754 | Bracket |
| 188 | 2219-7651 | Bracket |
| 189 | 2219-7653 | Bracket |
| 190 | 2219-7654 | Bracket |
| 191 | 2219-7655 | Bracket |
| 192 | 2219-7656 | Bracket |
| 193 | 2219-7657 | Bracket |
| 194 | 2219-7661 | Bracket |
| 196 | 2219-7668 | Bracket |
| 198 | 2219-7746 | Bracket |
| 199 | 2219-7797 | Bracket |
| 200 | 2219-7798 | Bracket |
| 201 | 2219-7800 | Bracket |
| 203 | 2219-7091 | Bracket |
| 204 | 2219-7799 | Bracket |
| 205 | 2219-7801 | Bracket |
| 215 | 2240-7120 | Holder |
| 219 | 2363-501716 | Bushing |
| 222 | 2132-301521 | Spacer |
| 223 | 2132-3008021 | Spacer |
| 224 | 2132-01702 | Spacer |
| 234 | 2651-210188 | Spring |
| 235 | 2651-210190 | Spring |
| 236 | 2651-210189 | Spring |
| 239 | 2652-00253 | Leaf Spring |
| 245 | 2218-7001 | Holding Bracket |
| 248 | 2440-61 | Special Nut |
| 250 | 2222-7131 | Heat Sink |
| 271 | 2320-7004 | Special Screw (+) |
| 277 | 2112-11248 | Sponge |
| 278 | 2114-01224 | Bushing |
| 279 | 2111-1442 | Felt |
| 280 | 2222-5039 | Heat Sink |
| 281 | 2222-5040 | Heat Sink |
| 282 | 2132-01703 | Spacer |



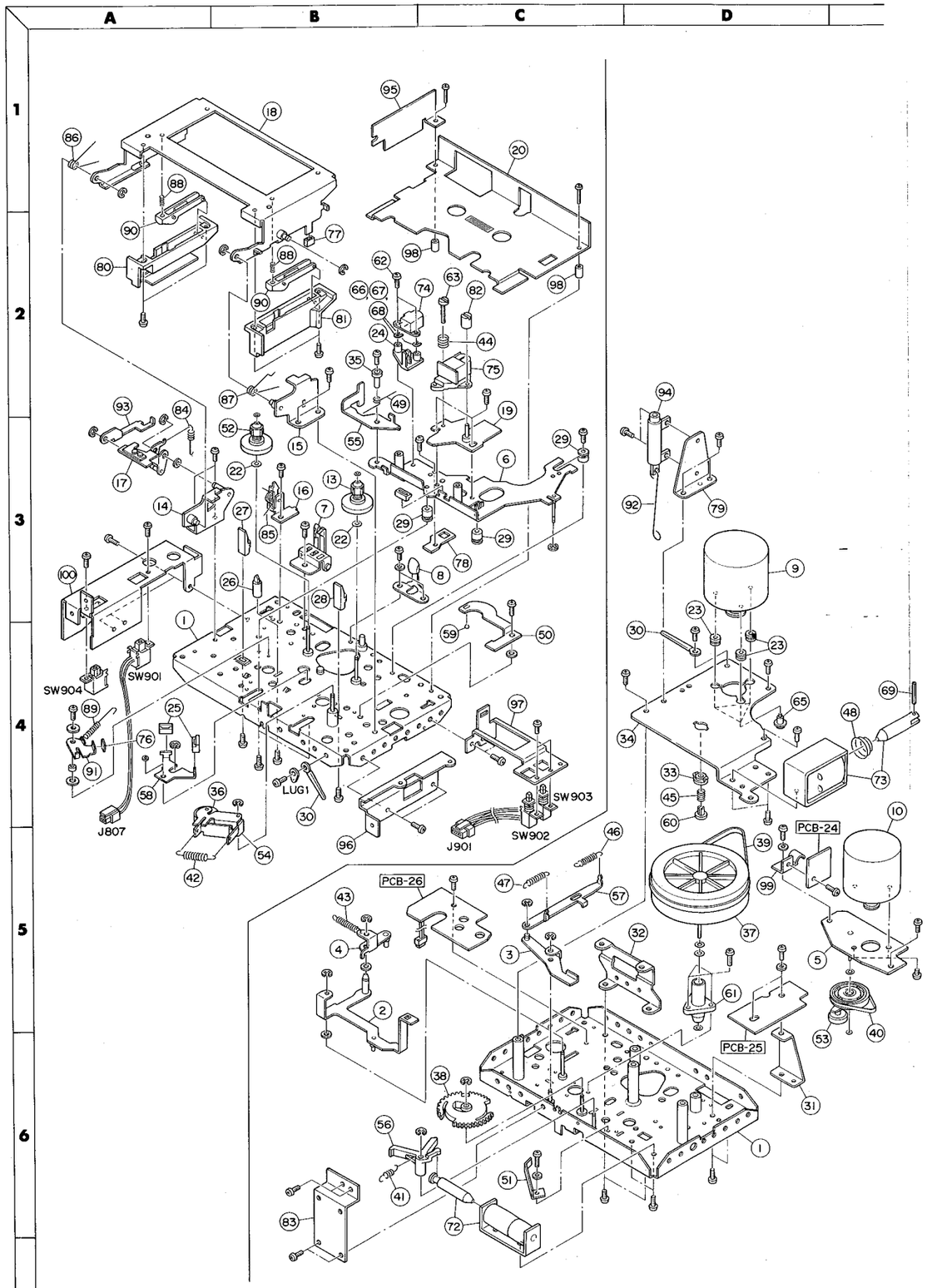

## GENERAL UNIT PARTS LIST

| Ref. No. | Part No. | Description |
|---|---|---|
| 101 | A414-CD401A | Cabinet Top Assembly |
| 102 | A423-CD401A | Cabinet Bottom Assembly |
| 103 | A443-CD401A | Front Panel Assembly |
| 104 | A452-CD401A | Door Assembly |
| 105 | A634-CD401A | Knob Assembly, Line Level (L) |
| 107 | A514-CD401A | Plate Assembly, LED Display Meter |
| 108 | A662-CD401A | Push Button Assembly, Electronic Auto Search, Rec. Mute, Equalization ($CrO_2$, FeCr, LN), Auto Rewind, Auto replay Meter Ballistics, Bias Tone, Record Cal. Tone, Timer |

| Ref. No. | Part No. | Description |
|---|---|---|
| 109 | A662-CD401B | Push Button Assembly, Bias ($CrO_2$, FeCr, LN), Dolby NR Type Selector, HX-PRO, MPX Filter |
| 110 | A662-CD401C | Push Button Assembly, Bias (Metal), Dolby NR System Selector |
| 111 | A662-CD401D | Push Button Assembly, Equalization (Metal) |
| 112 | A662-CD401E | Push Button Assembly, Power |
| 113 | A662-CD401F | Push Button Assembly, Eject |
| 114 | A662-CD401G | Push Button Assembly, Memory, Reset |
| 115 | B219-CD401A | Bracket Assembly |
| 116 | B424-CD401A | Cabinet Back Assembly |
| 117 | MR064HF(C) | Cassette Tape Recorder Mechanical Assembly(Basic Assembly Only) |
| 118 | 1319-0139 | Foot |
| 131 | 1441-00302 | Clear Panel |
| 148 | 1630-02001 | Knob, Microphone Level (L) |
| 151 | 1630-01801 | Knob, Line Level (R) |
| 154 | 1630-01901 | Knob, Bias Fine Trim, Output Level, Fader |
| 158 | 1634-03301 | Knob, Microphone Level (R) |
| 170 | 1662-05901VN | Push Button, Record, Rew., Play, F.FWD, Stop, Pause |
| 171 | 1662-08301 | Push Button, Tape Monitor |
| 176 | 2111-1356 | Felt, Microphones Jack, Headphones Jack |
| 180 | 2114-72167 | Bushing, Microphones Jack, Headphones Jack |
| 181 | 2114-415027 | Bushing, AC Line Cord |
| 183 | 2216-7127 | Shield Plate |
| 185 | 2219-7737 | Bracket |
| 186 | 2219-7093 | Bracket |
| 187 | 2219-7754 | Bracket |
| 188 | 2219-7651 | Bracket |
| 189 | 2219-7653 | Bracket |
| 190 | 2219-7654 | Bracket |
| 191 | 2219-7655 | Bracket |
| 192 | 2219-7656 | Bracket |
| 193 | 2219-7657 | Bracket |
| 194 | 2219-7661 | Bracket |
| 196 | 2219-7668 | Bracket |
| 198 | 2219-7746 | Bracket |
| 199 | 2219-7797 | Bracket |
| 200 | 2219-7798 | Bracket |
| 201 | 2219-7800 | Bracket |
| 203 | 2219-7091 | Bracket |
| 204 | 2219-7799 | Bracket |
| 205 | 2219-7801 | Bracket |
| 215 | 2240-7120 | Holder |
| 219 | 2363-501716 | Bushing |
| 222 | 2132-301521 | Spacer |
| 223 | 2132-3008021 | Spacer |
| 224 | 2132-01702 | Spacer |
| 234 | 2651-210188 | Spring |
| 235 | 2651-210190 | Spring |
| 236 | 2651-210189 | Spring |
| 239 | 2652-00253 | Leaf Spring |
| 245 | 2218-7001 | Holding Bracket |
| 248 | 2440-61 | Special Nut |
| 250 | 2222-7131 | Heat Sink |
| 271 | 2320-7004 | Special Screw (+) |
| 277 | 2112-11248 | Sponge |
| 278 | 2114-01224 | Bushing |
| 279 | 2111-1442 | Felt |
| 280 | 2222-5039 | Heat Sink |
| 281 | 2222-5040 | Heat Sink |
| 282 | 2132-01703 | Spacer |

h, Rec. Mute,
d, Auto replay
e, Timer

## CASSETTE MECHANISM EXPLODED VIEW

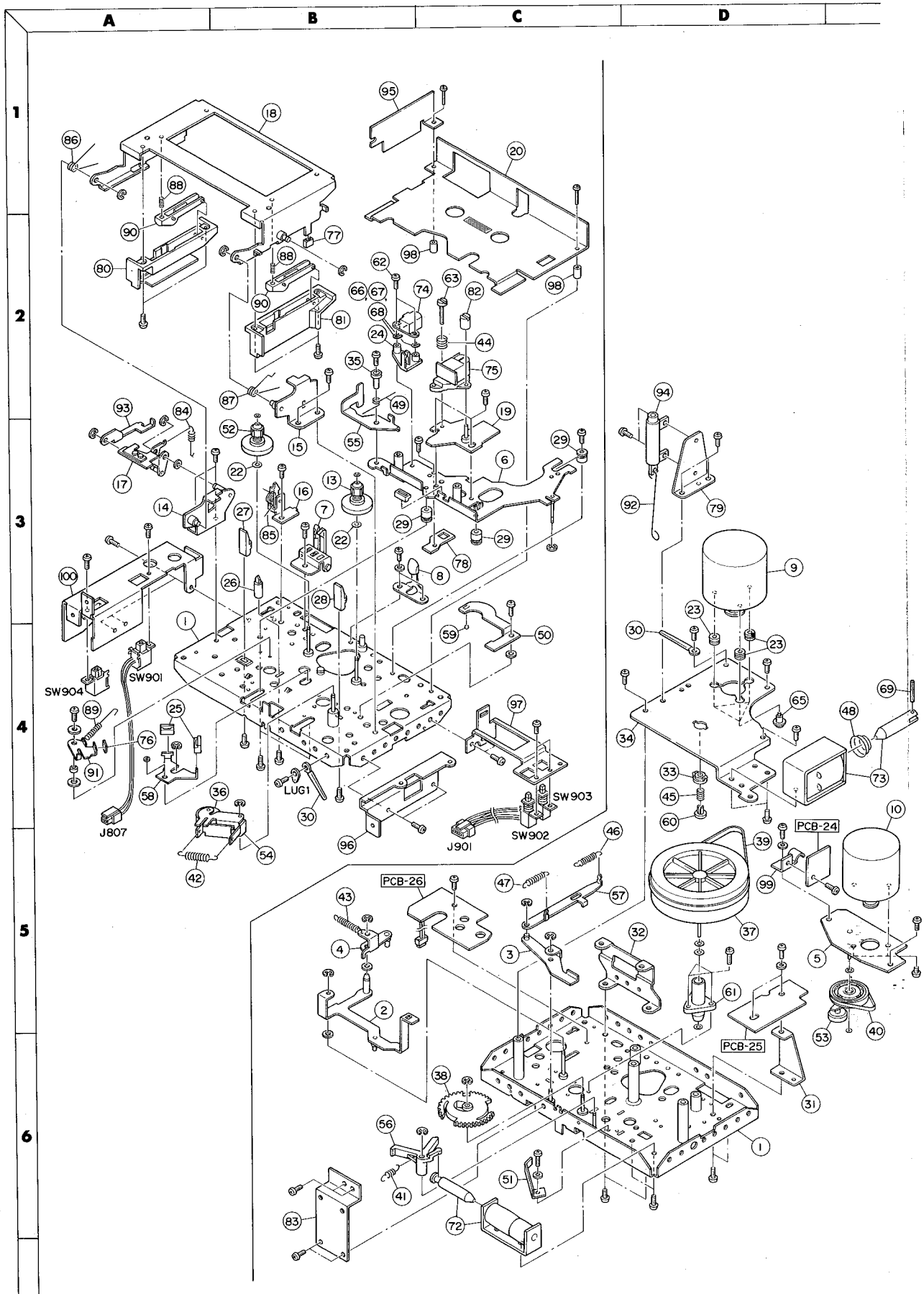





## CASSETTE MECHANISM PARTS LIST

| Ref. No. | Part No. | Description |
|---|---|---|
| 1 | B211-MR064HFA | Chassis Assembly |
| 2 | B672-MR064HFA | Lever Assembly, Brake |
| 3 | B672-MR064HFB | Lever Assembly, Play Main |
| 4 | B672-MR064HFC | Lever Assembly, Cue |
| 5 | B251-MR064HFA | Bracket Assembly, Motor |
| 6 | B674-MR064HFB | Slider Assembly, sub chassis |
| 7 | B219-MR064HFA | Bracket Assembly, Switches |
| 8 | B652-MR064HFA | Leaf Spring Assembly, Cassette Positioning |
| 9 | D311-MR064HFA | DC Motor Assembly, Main |
| 10 | D311-MR064HFB | DC Motor Assembly, Sub |
| 13 | B661-MR064HFA | Take-Up Reel Spindle Assembly |
| 14 | B219-MR064HFB | Bracket Assembly, Lid Left |
| 15 | B219-MR064HFC | Bracket Assembly, Lid Right |
| 16 | B219-MR064HFD | Bracket Assembly, Lid Lock Lever |
| 17 | B672-MR064HFD | Lever Assembly, Eject |
| 18 | A614-MR064HFA | Lid Assembly |
| 19 | B219-MR064HFE | Bracket Assembly, Head Base |
| 20 | A514-CD401MA | Dressing Plate Assembly (Includes: Lamp) |
| 22 | 2111-1357 | Felt |
| 23 | 2114-18 | Bushing |
| 24 | 2132-5092 | Spacer |
| 25 | 2135-5004 | Brake Shoe |
| 26 | 2142-5005 | Guide |
| 27 | 2142-5006 | Guide |
| 28 | 2142-5011 | Guide |
| 29 | 2142-5013 | Guide |
| 30 | 2218-7001 | Holding Bracket |
| 31 | 2218-5017 | Holding Bracket |
| 32 | 2219-5614 | Bracket |
| 33 | 2240-5090 | Holder |
| 34 | 2251-5046 | Bracket, Motor |
| 35 | 2363-55150 | Boss |
| 36 | 2614-5030 | Pinch Roller |
| 37 | 2617-5163 | Flywheel |
| 38 | 2622-5036 | Gear |
| 39 | 2642-02418 | Belt, Main |
| 40 | 2642-02415 | Belt, Sub |
| 41 | 2651-1103452 | Spring |
| 42 | 2651-1103453 | Spring |
| 43 | 2651-1103411 | Spring |
| 44 | 2651-2101413 | Spring |
| 45 | 2651-210164 | Spring |
| 46 | 2651-1103455 | Spring |
| 47 | 2651-1103454 | Spring |
| 48 | 2651-222010 | Spring |
| 49 | 2651-5169 | Spring |
| 50 | 2652-5165 | Leaf Spring |
| 51 | 2652-5163 | Leaf Spring |
| 52 | 2661-415032 | Supply Reel Spindle |
| 53 | 2662-5020 | Clutch |
| 54 | 2672-5305 | Lever |
| 55 | 2672-5350 | Lever |
| 56 | 2672-5352 | Lever |
| 57 | 2674-5271 | Slider |
| 58 | 2677-5007 | Brake |
| 59 | 2711-002021 | Steel Ball |
| 60 | 2712-5020 | Bearing |

# CASSETTE MECHANISM EXPLODED VIEW




| Ref. |
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# CASSETTE MECHANISM PARTS LIST

| Ref. No. | Part No. | Description |
|---|---|---|
| 1 | B211-MR064HFA | Chassis Assembly |
| 2 | B672-MR064HFA | Lever Assembly, Brake |
| 3 | B672-MR064HFB | Lever Assembly, Play Main |
| 4 | B672-MR064HFC | Lever Assembly, Cue |
| 5 | B251-MR064HFA | Bracket Assembly, Motor |
| 6 | B674-MR064HFB | Slider Assembly, sub chassis |
| 7 | B219-MR064HFA | Bracket Assembly, Switches |
| 8 | B652-MR064HFA | Leaf Spring Assembly, Cassette Positioning |
| 9 | D311-MR064HFA | DC Motor Assembly, Main |
| 10 | D311-MR064HFB | DC Motor Assembly, Sub |
| 13 | B661-MR064HFA | Take-Up Reel Spindle Assembly |
| 14 | B219-MR064HFB | Bracket Assembly, Lid Left |
| 15 | B219-MR064HFC | Bracket Assembly, Lid Right |
| 16 | B219-MR064HFD | Bracket Assembly, Lid Lock Lever |
| 17 | B672-MR064HFD | Lever Assembly, Eject |
| 18 | A614-MR064HFA | Lid Assembly |
| 19 | B219-MR064HFE | Bracket Assembly, Head Base |
| 20 | A514-CD401MA | Dressing Plate Assembly (Includes: Lamp) |
| 22 | 2111-1357 | Felt |
| 23 | 2114-18 | Bushing |
| 24 | 2132-5092 | Spacer |
| 25 | 2135-5004 | Brake Shoe |
| 26 | 2142-5005 | Guide |
| 27 | 2142-5006 | Guide |
| 28 | 2142-5011 | Guide |
| 29 | 2142-5013 | Guide |
| 30 | 2218-7001 | Holding Bracket |
| 31 | 2218-5017 | Holding Bracket |
| 32 | 2219-5614 | Bracket |
| 33 | 2240-5090 | Holder |
| 34 | 2251-5046 | Bracket, Motor |
| 35 | 2363-55150 | Boss |
| 36 | 2614-5030 | Pinch Roller |
| 37 | 2617-5163 | Flywheel |
| 38 | 2622-5036 | Gear |
| 39 | 2642-02418 | Belt, Main |
| 40 | 2642-02415 | Belt, Sub |
| 41 | 2651-1103452 | Spring |
| 42 | 2651-1103453 | Spring |
| 43 | 2651-1103411 | Spring |
| 44 | 2651-2101413 | Spring |
| 45 | 2651-210164 | Spring |
| 46 | 2651-1103455 | Spring |
| 47 | 2651-1103454 | Spring |
| 48 | 2651-222010 | Spring |
| 49 | 2651-5169 | Spring |
| 50 | 2652-5165 | Leaf Spring |
| 51 | 2652-5163 | Leaf Spring |
| 52 | 2661-415032 | Supply Reel Spindle |
| 53 | 2662-5020 | Clutch |
| 54 | 2672-5305 | Lever |
| 55 | 2672-5350 | Lever |
| 56 | 2672-5352 | Lever |
| 57 | 2674-5271 | Slider |
| 58 | 2677-5007 | Brake |
| 59 | 2711-002021 | Steel Ball |
| 60 | 2712-5020 | Bearing |

| Ref. No. | Part No. | Description |
|---|---|---|
| 61 | 2712-5026 | Bearing |
| 62 | 2310-5009 | Special Screw (—) |
| 63 | 2310-5017 | Special Screw (—) |
| 65 | 2310-5019 | Special Screw (—) |
| 66 | 2410-5017 | Special Washer } Head Height Adjustment |
| 67 | 2410-5018 | Special Washer |
| 68 | 2410-5019 | Special Washer |
| 69 | 2425-3016722 | Spring Pin |
| 72 | 4333-40216 | DC Solenoid, Play |
| 73 | 4333-40514 | DC Solenoid, Brake |
| 74 | 5873-1217 | Erase Head |
| 75 | 5874-1322 | Record/Playback Head |
| 76 | 2111-11464 | Felt |
| 77 | 2114-415090 | Bushing |
| 78 | 2219-5648 | Bracket |
| 79 | 2219-5672 | Bracket |
| 80 | 2240-5139 | Holder |
| 81 | 2240-5140 | Holder |
| 82 | 2440-5004 | Special Nut |
| 83 | 2219-7802 | Bracket |
| 84 | 2651-1101409 | Spring |
| 85 | 2651-5147 | Spring |
| 86 | 2651-5155 | Spring |
| 87 | 2651-5157 | Spring |
| 88 | 2651-2101411 | Spring |
| 89 | 2651-1101405 | Spring |
| 90 | 2672-5311 | Lever |
| 91 | 2672-5312 | Lever |
| 92 | 2673-5028 | Link |
| 93 | 2674-5190 | Slider |
| 94 | 2692-3 | Damper |
| 95 | 1514-05601 | Plate |
| 96 | 2219-7667 | Bracket |
| 97 | 2219-7704 | Bracket |
| 98 | 2362-961409 | Boss |
| 99 | 2222-7133 | Heat Sink |
| 100 | 2219-7662 | Bracket |

# ELECTRICAL PARTS LIST

| Ref. No. | Part No. | Description |
|---|---|---|
| | **CHASSIS MISCELLANEOUS** | |
| P1 | 4161-0487 | AC Line Cord |
| T1 | 5584-701369 | Power Transformer |
| PL2 | 5731-1407123 | Lamp, Cassette Illumination |
| CO1 | 4443-712 | Connector, AC Line Cord |
| D904 | 5623-LT1043 | LED Display, Peak Level Meter |
| SW901, 904 | 4431-01027195 | Push Switch, Electronic Auto Search, Rec. Mute |
| SW902 | 4431-01027269 | Push Switch, Reset |
| SW903 | 4431-01027169 | Push Switch, Memory |
| J101 | 4163-74853 | Connector with Lead Wire, 2-Pin |
| J171 | 4163-73853 | Connector with Lead Wire, 3-Pin |
| J181 | 4163-74953 | Connector with Lead Wire, 3-Pin |
| J182 | 4163-73753 | Connector with Lead Wire, 3-Pin |
| J201 | 4163-74453 | Connector with Lead Wire, 3-Pin |
| J202 | 4163-70353 | Connector with Lead Wire, 3-Pin |
| J251 | 4163-73453 | Connector with Lead Wire, 3-Pin |
| J301, 473 | 4163-73553 | Connector with Lead Wire, 3-Pin |
| J401 | 4163-74653 | Connector with Lead Wire, 3-Pin |
| J441 | 4163-74753 | Connector with Lead Wire, 4-Pin |
| J471 | 4163-71053 | Connector with Lead Wire, 2-Pin |
| J472 | 4163-74253 | Connector with Lead Wire, 6-Pin |
| J551 | 4163-74553 | Connector with Lead Wire, 3-Pin |
| J552 | 4163-74353 | Connector with Lead Wire, 3-Pin |
| J601 | 4163-71853 | Connector with Lead Wire, 3-Pin |
| J701 | 4163-042501 | Connector with Lead Wire, 4-Pin |
| J751 | 4163-101301 | Connector with Lead Wire, 10-Pin |
| J801 | 4163-73953 | Connector with Lead Wire, 6-Pin |
| J802 | 4163-74053 | Connector with Lead Wire, 7-Pin |
| J803 | 4163-062501 | Connector with Lead Wire, 6-Pin |
| J804 | 4163-70353 | Connector with Lead Wire, 3-Pin |
| J805 | 4163-080901 | Connector with Lead Wire, 8-Pin |
| J806 | 4163-70453 | Connector with Lead Wire, 2-Pin |
| J807 | 4163-70553 | Connector with Lead Wire, 2-Pin |
| J808 | 4163-70453 | Connector with Lead Wire, 2-Pin |
| J809 | 4163-70181 | Connector with Lead Wire, 9-Pin |
| J901 | 4163-71653 | Connector with Lead Wire, 4-Pin |
| J902, 903 | 4163-111301 | Connector with Lead Wire, 11-Pin |
| J904 | 4163-70665 | Connector with Lead Wire, 7-Pin |
| JM301 | 4242-030012 | Jumper Lead, 3-Wire |
| JM401 | 4242-032002 | Jumper Lead, 3-Wire |
| JM801 | 4242-082702 | Jumper Lead, 8-Wire |
| LUG1 | 4211-4 | Lug Terminal |
| | **PCB-1 MAIN P.C. BOARD** | |
| | **RESISTORS** | |
| R14 | 5102-4R75713 | 4.7Ω, ±5%, 1/4W, Fuse |
| R235, 236 | 5102-2714715 | 270Ω, ±2%, 1/4W, Fuse |
| R256 | 5102-4R75715 | 4.7Ω, ±5%, 1/4W, Fuse |
| R441 | 5102-2204713 | 22Ω, ±2%, 1/4W, Fuse |
| R442 | 5102-8204713 | 82Ω, ±2%, 1/4W, Fuse |
| R507, 508 | 5174-162381 | 1.6kΩ, ±1%, 1/4W, Metal |
| R511, 512, 547, 548, 601, 602, 641, 642 | 5174-133381 | 10kΩ, ±2%, 1/4W, Fuse |
| R533, 534, 661, 662 | 5174-112381 | 1.1kΩ, ±1%, 1/4W, Metal |
| R555, 556, 607, 608 | 5174-512381 | 5.1kΩ, ±1%, 1/4W, Metal |
| R739, 740 | 5102-1004715 | 10 kΩ, ±2%, 1/4W, Fuse |
| | **CONTROLS** | |
| VR101, 102 | 5101-2238575 | 22kΩB |
| VR103, 104 | 5101-10271920 | 1kΩB |
| VR203, 204, 205, 206, 207, 208, 209, 210, 503, 504, 505, 506, 573, 574, 575, 576 | 5101-10371920 | 10kΩB |
| VR251, 252, 253 | 5101-20371920 | 20kΩB |
| VR501, 502, 571, 572 | 5101-20271913 | 2kΩB |

| Ref. No. | Part No. | Description |
|---|---|---|
| VR673, 674 | 5101-5037189 | 50kΩB |
| | **CAPACITORS** | |
| C4, 5 | 5345-228D041 | 2200μF, ±20%, 25V, Electrolytic |
| C6, 7, 10, 555, 556, 721, 722, 637, 638, 753 | 5345-226C041 | 22μF, ±20%, 16V, Electrolytic |
| C8, 9 | 5345-108C041 | 1000μF, ±20%, 16V, Electrolytic |
| C51 | 5345-475-50 | 4.7μF, +75% −10%, 50V, Electrolytic |
| C52 | 5345-226D0211 | 22μF, ±20%, 25V, Electrolytic |
| C53 | 5345-227D041 | 220μF, ±20%, 25V, Electrolytic |
| C54, 503, 504, 571, 572, 581, 582 | 5345-227C041 | 220μF, ±20%, 16V, Electrolytic |
| C117, 118, 119, 120, 207 208, 215, 216, 233, 234, 551, 552, 579, 580, 589, 590, 635, 636 | 5345-106C0951 | 10μF, ±20%, 16V, Electrolytic |
| C125, 209, 210, 251 | 5345-476C041 | 47μF, ±20%, 16V, Electrolytic |
| C213, 214 | 5352-684571 | 0.68μF, ±5%, 63V, Metal |
| C219, 220 | 5345-107C041 | 100μF, ±20%, 16V, Electrolytic |
| C501, 502, 573, 574, 513, 514, 531, 532, 535, 536, 595, 596, 599, 600, 619, 620 | 5345-105F0951 | 1μF, ±20%, 50V, Electrolytic |
| C519, 520, 525, 526, 539, 540, 549, 550, 575, 576, 603, 604, 613, 614, 627, 628, 633, 634, 702, 959 | 5345-106-16 | 10μF, +50% −10%, 16V, Electrolytic |
| C505, 506, 583, 584 | 5345-477C041 | 470μF, ±20%, 16V, Electrolytic |
| C553, 554 | 5345-476B041 | 47μF, ±20%, 10V, Electrolytic |
| C509, 510, 515, 516, 527, 528, 533, 534, 591, 592, 597, 598, 615, 616, 621, 622 | 5359-153771 | 0.015μF, ±2%, 50V, Polypropylene |
| C751 | 5345-225-50 | 2.2μF, +75% −10%, 50V, Electrolytic |
| C752 | 5345-104F0211 | 0.1μF, ±20%, 50V, Electrolytic |
| C953 | 5345-104F0212 | 0.1μF, ±20%, 50V, Electrolytic |
| C958 | 5345-224F0212 | 0.22μF, ±20%, 50V, Electrolytic |
| C960 | 5345-105-50 | 1μF, +75% −10%, 50V, Electrolytic |
| | **INTEGRATED CIRCUIT** | |
| IC201 | 5652-μPC4558C | μPC4558C |
| IC501, 502, 503, 504 | 5652-HA11226 | HA11226 |
| IC951 | 5652-BA335 | BA335 |
| | **TRANSISTORS** | |
| Q1 | 5612-855(C) | 2SB855(C) |
| Q2, 675, 676 | 5613-2603(F) | 2SC2603(F) |
| Q3, | 5611-1115(F) | 2SA1115(F) |
| Q4 | 5613-1419(C) | 2SC1419(C) |
| Q5 | 5613-2236(Y) | 2SD2236(Y) |
| Q51, 52, 503, 504, 575, 576, 591, 592, 703, 751 | 5611-1115(F) or (E) | 2SA1115(F) or 2SA1115(E) |
| Q53, 252, 501, 502, 505 506, 507, 508, 509, 510, 511, 512, 513, 514, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 701, 752, 753, 754, 759, 760, 951 | 5613-2603(F) or (E) | 2SC2603(F) or 2SC2603(E) |
| Q111, 112, 573, 574 | 5613-2320L(F) | 2SC2320L(F) |
| Q251 | 5614-667(C) | 2SD667(C) |
| Q571, 572 | 5611-999L(F) | 2SA999L(F) |
| Q673, 674 | 5616-2SK163(M) | 2SK163(M) |
| Q702 | 5612-647(C) | 2SB647(C) |
| Q755, 756 | 5613-2878(B) | 2SC2878(B) |
| | **DIODES** | |
| D1 | 5685-1F | Bridge Silicon, S1WB10 |

-1F

| Ref. No. | Part No. | Description |
|---|---|---|
| D2, 5, 51, 52, 53, 54, 55, 56, 57, 251, 252, 253, 254, 503, 504 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 573, 574, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 591, 675, 701, 751, 756, 757, 758, 951, 952, 953 | 5631-1S2473 | 1S2473 |
| D3, 4 | 5635-RD9R1EB2 | Zener, RD9.1EB2 |
| D501, 502, 505, 506, 519, 520, 571, 572, 575, 576, 589, 590 | 5631-1K34A | 1K34A |
| | **COILS** | |
| L101, 102 | 5933-70314 | 27mH |
| L103, 104 | 5933-70416 | 4.7mH |
| L201, 202 | 5933-70116 | 3.3mH |
| L252 | 5995-101325 | 100μH |
| L571, 572 | 5995-363156 | 36mH |
| LC201, 202 | 5932-70116 | |
| LC203, 204 | 5932-70115 | |
| LC571, 572 | 5214-28 | |
| | **MISCELLANEOUS** | |
| OS101 | 6171-0406 | Complex, Osc. |
| SW251, 252, 253, 254 | 4431-04167957 | Push Switch, Bias Selectors (LN, FeCr, $CrO_2$, Metal) |
| SW501, 502, 503, 504 | 4431-04087657 | Push Switch, Dolby NR, NR Type, HX-PRO, MPX Filter |
| P201, 202, 551, 552, 601 | 4443-030158 | Connector, 3 Pin |
| P701 | 4443-040177 | Connector, 4 Pin |
| P751 | 4443-100177 | Connector, 10 Pin |
| JM201 | 4242-030802 | Jumper Lead, 3-Wire |
| | 2132-5049 | Spacer |
| | **PCB-2 MIC. AND LINE AMP. P.C. BOARD** | |
| | **RESISTORS** | |
| R169, 170 | 5102-1014715 | 100Ω, ±2%, 1/4W, Fuse |
| R435, 436 | 5102-1214715 | 120Ω, ±2%, 1/4W, Fuse |
| | **CONTROLS** | |
| VR151, 152 | 5113-5037182 | 50kΩA, Microphones Level |
| VR155, 156 | 5113-50374122 | 50kΩB, Fader Control |
| VR254 | 5113-2027821 | 2kΩB, Bias Fine Trim |
| VR301, 302 | 5113-5027F40 | 5kΩA, Output Level |
| VR401, 402 | 5101-50371920 | 50kΩB |
| | **CAPACITORS** | |
| C151, 152 | 5345-106C0212 | 10μF, ±20%, 16V, Electrolytic |
| C155, 156 | 5345-107B041 | 100μF, ±20%, 10V, Electrolytic |
| C159, 160 | 5345-105F0212 | 1μF, ±20%, 50V, Electrolytic |
| C161, 162 | 5345-476C041 | 47μF, ±20%, 16V, Electrolytic |
| C307, 308 | 5342-226C0951 | 22μF, ±20%, 16V, Electrolytic |
| C361, 409, 410 | 5345-226C041 | 22μF, ±20%, 16V, Electrolytic |
| C401, 402 | 5345-105-50 | 1μF, +75% −10%, 50V, Electrolytic |
| C403, 404 | 5345-475-25 | 4.7μF, +75% −10%, 25V, Electrolytic |
| C407, 408 | 5345-225F0211 | 4.7μF, +75% −10%, 25V, Electrolytic |
| C421, 422 | 5345-224F0212 | 0.22μF, ±20%, 50V, Electrolytic |

| Ref. No. | Part No. | Description |
|---|---|---|
| C423, 424 | 5345-106-16 | 10μF, +50% −10%, 16V, Electrolytic |
| | **INTEGRATED CIRCUITS** | |
| IC401, 421 | 5652-LA6458 | LA6458 |
| | **TRANSISTORS** | |
| Q151, 152 | 5613-2320L(F) | 2SC2320L(F) |
| Q153, 154 | 5611-999L(F) | 2SA999L(F) |
| Q301, 302 | 5616-170 (GR) | F.E.T., 2SK170(GR) |
| Q303, 304 | 5615-74(GR) | F.E.T., 2SJ74(GR) |
| Q305, 306 | 5611-984(F) | 2SA984(F) |
| Q307, 308 | 5613-2274(F) | 2SC2274(F) |
| Q309, 310 | 5613-2603(F) or (E) | 2SC2603(F) or 2SC2603(E) |
| Q351 | 5613-2603(F) | 2SC2603(F) |
| Q421, 422, 423, 424 | 5613-2320(D) or (E) | 2SC2320(D) or 2SC2320(E) |
| Q757, 758 | 5613-2878(B) | 2SC2878(B) |
| | **DIODES** | |
| D401, 402 | 5631-1K34A | 1K34A |
| D421, 422, 753, 754 | 5631-1S2473 | 1S2473 |
| | **COILS** | |
| L301, 302 | 5995-363156 | 36mH |
| | **MISCELLANEOUS** | |
| J151, 152 | 4451-00106 | Jack, Microphones |
| P251, 301 | 4443-030158 | Connector, 3-Pin |
| | **PCB-3 LOGIC CONTROL P.C. BOARD** | |
| | **RESISTORS** | |
| R816, 859 | 5102-1004713 | 10Ω, ±2%, 1/4W, Fuse |
| R860 | 5102-1004715 | 10Ω, ±2%, 1/4W, Fuse |
| | **CONTROL** | |
| VR851 | 5101-50171920 | 500Ω |
| | **CAPACITORS** | |
| C808 | 5345-684F0212 | 0.68μF, ±20%, 50V, Electrolytic |
| C809 | 5345-106-16 | 10μF, +50% −10%, 16V, Electrolytic |
| C811 | 5345-476C0212 | 47μF, ±20%, 16V, Electrolytic |
| C812 | 5345-107C041 | 100μF, ±20%, 16V, Electrolytic |
| C813, 815 | 5345-226-16 | 22μF, +50% −10%, 16V, Electrolytic |
| C817 | 5342-226C0951 | 22μF, ±20%, 16V, Electrolytic |
| C818 | 5345-474-50 | 0.47μF, +75% −10%, 50V, Electrolytic |
| C831, 887 | 5345-335-25 | 3.3μF, +75% −10%, 25V, Electrolytic |
| | **INTEGRATED CIRCUITS** | |
| IC801 | 5654-TC9121P | TC9121P |
| IC802 | 5654-μPD4023C | μPD4023C |
| IC803, 806 | 5654-μPD4001C | μPD4001C |
| IC804 | 5654-μPD4011C | μPD4011C |
| IC805 | 5654-μPD4516C | μPD4516C |
| IC851 | 5653-BA6109 | BA6109 |
| | **TRANSISTORS** | |
| Q801, 856, 859 | 5613-2236(Y) | 2SC2236(Y) |
| Q803, 805, 808, 855, 858 | 5611-1115(E) or (F) | 2SA1115(E) or 2SA1115(F) |
| Q804, 806, 807, 852, 853, 854, 857 | 5613-2603(E) or (F) | 2SC2603(E) or 2SC2603(F) |

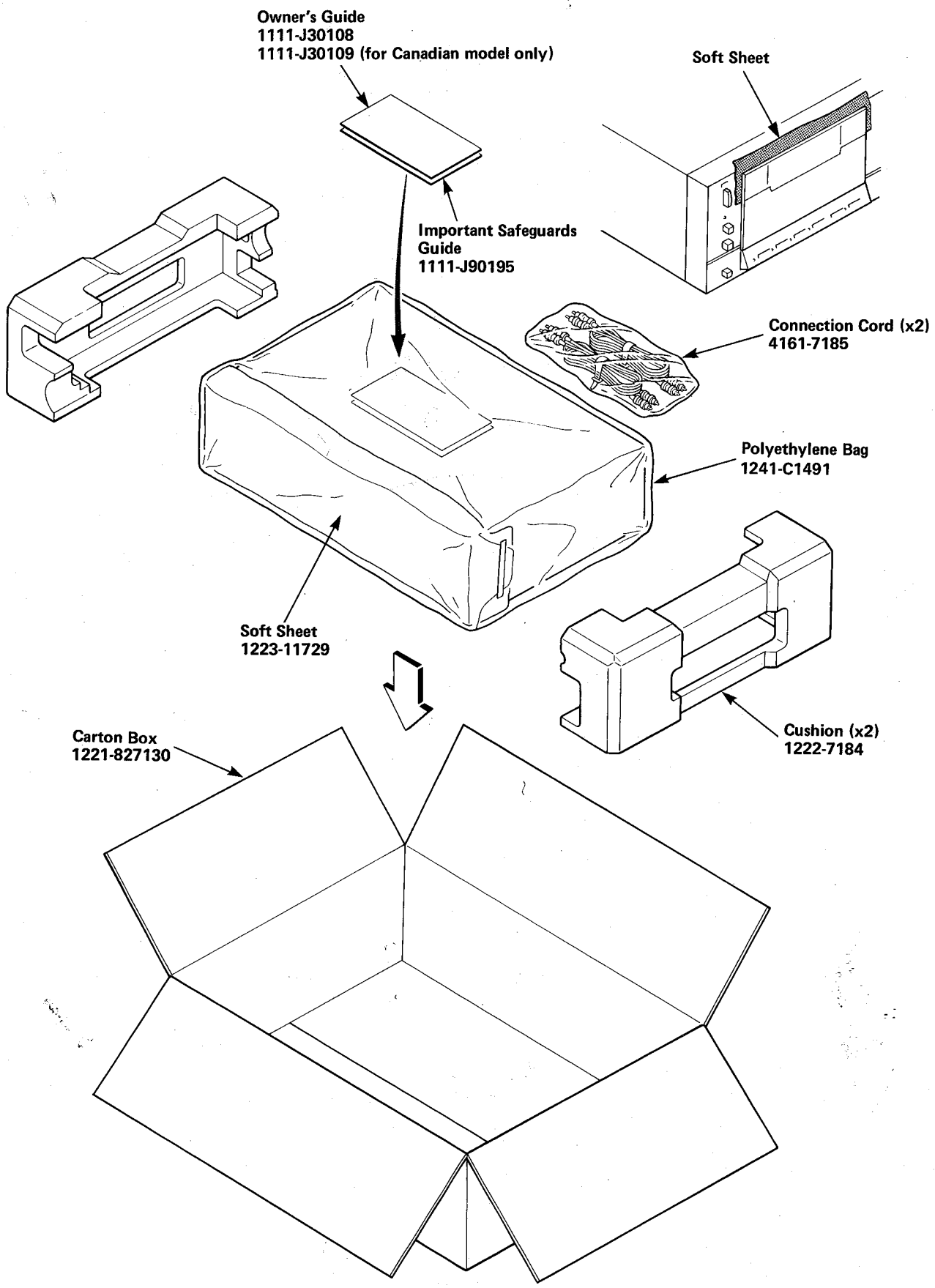
| Ref. No. | Part No. | Description |
|---|---|---|
| | **DIODES** | |
| D801, 802, 803, 804, 805 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837 | 5631-1S2473 | 1S2473 |
| D851, 852 | 5635-RD10EB2 | Zener, RD10EB2 |
| | **MISCELLANEOUS** | |
| P801 | 4443-060158 | Connector, 6-Pin |
| P802 | 4443-070158 | Connector, 7-Pin |
| P803 | 4443-060177 | Connector, 6-Pin |
| P804 | 4443-030158 | Connector, 3-Pin |
| P805 | 4443-080177 | Connector, 8-Pin |
| P806, 807, 808 | 4443-020158 | Connector, 2-Pin |
| P809 | 4443-090177 | Connector, 9-Pin |
| | **PCB-4 HX-PRO P.C. BOARD** | |
| | **RESISTORS** | |
| R687, 688 | 5102-1004715 | 10Ω, ±2%, 1/4W, Fuse |
| | **CONTROLS** | |
| VR671, 672 | 5101-20371920 | 20kΩB |
| | **CAPACITORS** | |
| C685, 686 | 5345-476C041 | 47μF, +50% −10%, 16V, Electrolytic |
| | **INTEGRATED CIRCUITS** | |
| IC671, 672 | 5652-HA17082PS | HA17082PS |
| IC673 | 5652-NJM4559D | NJM4559D |
| | **TRANSISTORS** | |
| Q671, 672 | 5614-667(C) | 2SD667(C) |
| | **DIODES** | |
| D671, 672, 673, 674 | 5631-1S2473 | 1S2473 |
| | **COILS** | |
| L671, 672 | 5933-70123 | |
| | **MISCELLANEOUS** | |
| P651 | 4443-117167 | Connector, 11-Pin |
| | **PCB-5 PLAYBACK EQUALIZER AMP. P.C. BOARD** | |
| | **RESISTORS** | |
| R111, 112, 117, 118 | 5174-562381 | 5.6kΩ, ±1%, 1/4 W, Metal |
| R113, 114 | 5174-183381 | 18kΩ, ±1%, 1/4W, Metal |
| | **CAPACITORS** | |
| C103, 104 | 5345-226C0226 | 22μF, ±20%, 16V, Electrolytic |
| C105, 106 | 5345-227A0951 | 220μF, ±20%, 6.3V, Electrolytic |
| C107, 108, 109, 110 | 5359-222771 | 2200pF, ±2%, 50V, Polypropylene |
| C111, 112 | 5345-106C0951 | 10μF, ±20%, 16V, Electrolytic |
| C113, 114 | 5345-107C041 | 100μF, ±20%, 16V, Electrolytic |

| Ref. No. | Part No. | Description |
|---|---|---|
| | **TRANSISTORS** | |
| Q101, 102 | 5611-1190(E) or (D) | 2SA1190(E) or 2SA1190(D) |
| Q103, 104 | 5613-2855(E) or (D) | 2SC2855(E) or 2SC2855(D) |
| Q105, 106 | 5613-2320L(F) | 2SC2320L(F) |
| Q107, 108 | 5611-999(F) | 2SA999(F) |
| Q109, 110 | 5613-2603(F) or (E) | 2SC2603(F) or 2SC2603(E) |
| | **DIODES** | |
| D101, 102 | 5641-MV11 | Varistor, MV11 |
| | **MISCELLANEOUS** | |
| P101 | 4443-067167 | Connector, 6-Pin |
| | **PCB-6 BIAS AND RECORD CAL TONE P.C. BOARD** | |
| | **RESISTORS** | |
| R486, 487 | 5102-1014713 | 100Ω, ±2%, 1/4W, Fuse |
| | **CONTROLS** | |
| VR471 | 5101-10271920 | 1kΩB |
| VR472, 473 | 5101-50371920 | 50kΩB |
| | **CAPACITORS** | |
| C475, 476 | 5345-105-50 | 1μF, +75% −10%, 50V, Electrolytic |
| C477, 478 | 5345-226C041 | 22μF, ±20%, 16V, Electrolytic |
| | **INTEGRATED CIRCUIT** | |
| IC471 | 5652-μPC4558C | μPC4558C |
| | **DIODES** | |
| D471, 472, 473, 474 | 5635-RD5R1EB2 | Zener, RD5.1EB2 |
| | **MISCELLANEOUS** | |
| SW471, 472 | 4431-02127559 | Push Switch, Rec. Cal Tone, Bias Tone |
| P471 | 4443-020158 | Connector, 2-Pin |
| P472 | 4443-060158 | Connector, 6-Pin |
| P473 | 4443-030171 | Connector, 3-Pin |
| | **PCB-7 HEADPHONE JACK P.C. BOARD** | |
| | **RESISTORS** | |
| R363, 364 | 5102-1014715 | 100Ω, ±2%, 1/4W, Fuse |
| | **CAPACITORS** | |
| C351, 352 | 5345-106-16 | 10μF, +50% −10%, 16V, Electrolytic |
| C355, 356 | 5345-474-50 | 0.47μF, +75% −10%, 50V, Electrolytic |
| C359, 360 | 5345-476C041 | 47μF, ±20%, 16V, Electrolytic |
| | **INTEGRATED CIRCUIT** | |
| IC351 | 5652-NJM4556D | NJM4556D |
| | **MISCELLANEOUS** | |
| J351 | 4451-00107 | Jack, Headphones |
| | **PCB-8 ELECTRONIC COUNTER P.C. BOARD** | |
| | **CAPACITOR** | |
| C902 | 5345-335F0212 | 3.3μF, ±20%, 50V, Electrolytic |
| | **INTEGRATED CIRCUITS** | |
| IC901 | 5654-TM3140B | TM3140B |
| IC902, 903, 904 | 5654-IR2403 | IR2403 |

| Ref. No. | Part No. | Description |
|---|---|---|
| | **TRANSISTOR** | |
| Q901 | 5613-2603(E)or(F) | 2SC2603(E) or 2SC2603(F) |
| | **DIODES** | |
| D901, 902 | 5631-1S2473 | 1S2473 |
| | **MISCELLANEOUS** | |
| P901 | 4443-040158 | Connector, 4-Pin |
| P902, 903 | 4443-110177 | Connector, 11-Pin |
| | **PCB-9 INPUT AND OUTPUT JACKS P.C. BOARD** | |
| J1, 2, 3, 4, 5, 6 | 4486-8 | 6-Pin Jack, Line Input (Low, High), Line Output |
| P181, 182 | 4443-030171 | Connector, 3-Pin |
| | **PCB-10 LINE INPUT LEVEL CONTROL P.C. BOARD** | |
| | **CONTROLS** | |
| VR153, 154 | 5113-5037182 | 50kΩA, Line Level |
| | **MISCELLANEOUS** | |
| P171 | 4443-030171 | Connector, 3-Pin |
| | **PCB-11 KEY SWITCHES P.C. BOARD** | |
| | **DIODES** | |
| D841 | 5637-TLR226 | L.E.D., TLR226, Red, Record |
| D842, 843, 844 | 5637-TLG226 | L.E.D., TLG226, Green, Rew., Play, F. FWD |
| D845 | 5637-TLY226 | L.E.D., TLY226, Yellow, Pause |
| | **MISCELLANEOUS** | |
| SW801, 802, 803, 804, 805, 806 | 4431-01017193 | Push Switch, Record, Rew., Play, F. FWD, Stop, Pause |
| | **PCB-12 TAPE MONITOR SWITCH P.C. BOARD** | |
| SW401 | 4431-01047894 | Push Switch, Tape Monitor |
| PL3 | 5731-0607142 | Lamp, Green |
| P441 | 4443-040158 | Connector, 4-Pin |
| | **PCB-13 TAPE SELECTORS P.C. BOARD** | |
| SW101, 102, 103, 104 | 4431-04087557 | Push Switch, LN, FeCr, $CrO_2$, METAL |
| P101 | 4443-020171 | Connector, 2-Pin |
| | **PCB-14 TIMER SWITCHES P.C. BOARD** | |
| SW810, 811, 812 | 4431-03067550 | Push Switch, Timer off/rec./play |
| | **PCB-15 METER BALLISTICS AND AUTO PLAY SWITCHES P.C. BOARD** | |
| | **CAPACITORS** | |
| C405, 406 | 5345-225F0211 | 2.2μF, ±20%, 50V, Electrolytic |
| | **MISCELLANEOUS** | |
| SW807, 808, 809 | 4431-03068150 | Push Switch, Meter ballistics, Auto Rewind/Replay |
| P401 | 4443-030171 | Connector, 3-Pin |
| | **PCB-16 DOLBY NR AND HX-PRO INDICATORS P.C. BOARD** | |
| D433 | 5637-GL9NG2 | L.E.D., GL9NG2, Green, Dolby NR B |
| D434 | 5637-GL9HY2 | L.E.D., GL9HY2, Yellow, Dolby NR C |
| D435 | 5637-GL9PR20 | L.E.D., GL9PR20, Red, HX-PRO |
| | **PCB-17 REC. CAL P.C. BOARD** | |
| VR201, 202 | 5101-1027274 | Control, 1kΩB, Record Cal. |

| Ref. No. | Part No. | Description |
|---|---|---|
| | **PCB-18 POWER SWITCH P.C. BOARD** | |
| C1 | 5361-1030419 | Capacitor, 0.01μF, +100% –0%, AC125V, Ceramic |
| SW1 | 4431-A01026 | Push Switch, Power |
| | **PCB-19 LAMP P.C. BOARD** | |
| PL1 | 5731-1507245 | Lamp, Clear |
| | **PCB-20 E.A.S. INDICATOR P.C. BOARD** | |
| D432 | 5637-TLG206 | L.E.D., TLG206, Green, Electronic Auto Search |
| | **PCB-21 POWER INDICATOR P.C. BOARD** | |
| D431 | 5637-GL9PR20 | L.E.D., GL9PR20, Red, Power |
| | **PCB-22 COUNTER DISPLAY P.C. BOARD** | |
| D903 | 5623-SL2495 | LED Display, Counter |
| | **PCB-23 REMOTE CONTROL SOCKET P.C. BOARD** | |
| SO2 | 4474-159 | DIN Jack |
| | **PCB-24 TORQUE CONTROL P.C. BOARD** | |
| Q891 | 5613-2320(E) or (F) | Transistor, 2SC2320(E) or 2SC2320(F) |
| | **PCB-25 MECH. TERMINAL P.C. BOARD** | |
| | **CAPACITORS** | |
| C951 | 5342-226C0951 | 22μF, ±20%, 16V, Electrolytic |
| | **DIODES** | |
| D981, 982 | 5632-1SR35-10 | 1SR35-100 |
| | **MISCELLANEOUS** | |
| SW981, 982 | 4463-48 | Spring Switch, Erase Protect, Cassette Det. |
| | **PCB-26 ROTATION SENSOR P.C. BOARD** | |
| PH981 | 5624-GP2S02(A) or (B) | Photo-Interrupter |

## PACKAGE


Owner's Guide
1111-J30108
1111-J30109 (for Canadian model only)
Soft Sheet
Important Safeguards Guide
1111-J90195
Connection Cord (x2)
4161-7185
Polyethylene Bag
1241-C1491
Soft Sheet
1223-11729
Cushion (x2)
1222-7184
Carton Box
1221-827130